JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

Local Authorities and Gas Company Legislation.

In the batch of Gas Acts noticed this week, there are indications of local authorities not losing their full pound of flesh for the sake of asking for it, and of an attitude of irreconcilability being taken up (whenever a settlement of differences is being sought) at anything below the level of their own desire and ambition. In saying this, we are not painting local authorities with a common brush; but there are, in the Acts reviewed this week, several features that plainly point to irrational claim and pressure. When will local authorities understand, if they would best serve the interests of their cities or towns, that their dealings with local enterprise and service ought not to be conducted with the hand of the oppressor, but with the hand of the helper? It is not encouraging to private enterprise to have unreasonable provisions forced upon them as the price of release from a local authority's hostility. Companies are doing all they can to replace the richness and (in the excess of richness) uselessness of the old-time gas by one of a more serviceable character, which, under the relaxing sanction of Parliament, can be supplied at lower prices. But the benefit of resulting prosperity ought not to go entirely to the consumer without some additional reward being left for the companies. It, however, looks as though this is what some—we reiterate, not all—local authorities are trying to prevent. It makes business one-sided; and it is not by any means the wisest way of encouraging the best service. Local authorities ignore the facts that, by whomsoever conducted, gas supply is a public service, and that it is amply controlled by the sliding-scale and the ordinary legislation, without further stringency and innovation.

Look at the Merthyr Gas Company's Act. Their maximum price was formerly 5s. per 1000 cubic feet for gas of a standard illuminating power of 14 candles. A standard price of 3s. for gas of the same standard quality was asked for in the Bill. In the circumstances of the Company, 3s. was an exceedingly reasonable figure; but that standard was reduced by 3d.—to 2s. 9d., at which figure they have not now, in point of lowness, more than (say) a dozen equals in the land. The element of fairness does not come into such squeezing as this; and the squeezing was great when the measure was before the House of Commons Committee. Then, in the case of the Mirfield Gas Company, they have dropped the standard of illuminating power 1 candle, to 15 candles; but for that single candle, they have had to surrender 3d. of their standard price, making it 3s. 9d. A reduction of 3d. is disproportionate with the reduction of 1 candle; and there ought to be in this regard some common principle followed, although it may be the proprietors of the Mirfield Company will have nothing to complain of in the long-run. But, looked at from another standpoint, the conditions of the Merthyr and Mirfield Companies are not so broadly diverse that there should be 1s. difference in the standard prices. In the Cardiff Act, too, there is an instance of the Corporation insisting—so we imagine—upon getting all they can, whether or not there is any tangibility about it. For Cardiff, so far as the future can be penetrated, it does not matter much whether the maximum price is nominally stated at 3s. 6d. within the borough and 4s. in the extra-mural districts (as in the Bill), or 3s. and 3s. 3d. respectively as they now appear. It all, however, goes to show that the tendency is to clip, clip, clip whenever opportunity arises, and leave as little margin as possible for the companies.

At the same time, the local authorities have a keen eye to the defence of their own position as the administrators of their towns' affairs. Their appetite is great for advantage, whether or not it is in the best interests of the ratepayers. We do not, for instance, think it is to the interest of industry in Cardiff or in the parish of Eglwysilam that the Gas Company should be inhibited from supplying dynamos, motors, or other electrical apparatus therein, though it may be in the interests of the Corporation Electricity Department. It was the fear of the competition of the private gas-engine and dynamo that gave form to the inhibition; but, to put it mildly, it is an impertinent interference with the liberty of industry to do anything to limit the choice of power by the withdrawal of conveniences, which may be enjoyed by those conducting similar industry outside the borough boundaries. But, of course, it is gas the Company want to sell, and there is nothing to prevent them supplying a gas-engine in the borough, to which can be coupled up a dynamo that the manufacturer can purchase, if he chooses, on his own account. Another way in which local authorities are beginning to look after their own interests—and in this we cannot blame them—is by ensuring that the effluent from gas-works shall be so dealt with as not to prejudicially affect the bacterial treatment of the sewage. This is a subject to which attention has of late been given in the "JOURNAL;" and instances of enactment on the subject will be found this week in the notices of the Cheltenham and the Epsom and Ewell Acts.

Perhaps, however, the most important happening in connection with the Acts under notice this week, is the insertion of the session's fresh creation for gas companies' legislation—a suspensory clause to enable the promotion, by the local authorities concerned, of a Bill in Parliament to purchase the gas undertakings. The Merthyr Tydfil Bill led off with this monstrous clause dragging at its heels; and the East Hull Bill followed. The clause has been discussed several times, and nothing new can be added to the protest against the pernicious provision. It is specifically stated that the clause is not to prejudge or prejudice the question of purchase; but its existence is a menace, and cannot fail to influence action. If we turn to the Cheltenham Act again, it is seen that, as part of the terms of settlement, the Corporation exacted almost plenary powers for their gas examiner in policing the Company. He may test the gas at any time without notice; similarly without notice he may climb to the tops of any of the lamp-posts to test the pressure—the rules to be observed by him in so doing being set out in the Act. Upon his request, too, the Company are compelled to remove any of the self-acting regulators and burners to ascertain the amount of gas passing through them. The Company agreed to these provisions, so that it is evident they do not fear them. But what has instigated this more active supervision? We look round, and the only answer that can be found has its source in the municipal supply of electricity. The provisions appear to have been framed in the hope of detecting any accidental slip on the part of the Company. It is offensive to honest men to be watched, and to have their actions pried into, after the manner of the treatment to which known criminals are subject. To increase the watch and make it more rigorous, infer past lapses; and that we cannot concede to be the case with the Cheltenham Company. It is nothing but the work of the Municipality in competition; and such work, carried to like extent, never crossed their minds in pre-electricity days. As large ratepayers, who have contributed considerably towards the support of the electricity undertaking, and are doing so now through the public lighting, it ought to be within the power of the Gas Company to move for, and obtain, the imposition of some strict regulation as to the supply of electricity in the borough.

There are two or three miscellaneous matters which hardly fall within the particular lines of this article, but to which prominence should be accorded. In the Mirfield Act, we have at last got quite clear of the limitation of discounts. In the Bill, the usual clause appeared; in the Act, there is merely the sensible stipulation that "the Company shall not give "any preferential price as between any consumers who "shall take a supply from the Company for like purposes,

"and under similar conditions and circumstances." From the Kidderminster Bill, too, the discount clause disappeared; but in the Act there is a variation of the prepayment meter clauses, which we think will hardly give the Company sufficient latitude in cases where the consumption is of poor amount. They are to be allowed to charge only 10d. excess to include everything—even a cooker. The Mirfield Company, on the other hand, have the right to charge 1s. extra, with "fittings" only—no mention being made of a cooker. Among other interesting features is the amendment of the public lighting clause in the Derby Act, by which the Corporation acknowledge that the clause when drafted long years since was intended to refer to the lowest price charged "for lighting purposes." In the Cardiff Act, it will be seen that some significant words have been appended to the sub-section of the fittings clause (which provides for fittings not being subject to distress): "Nothing in the preceding "sub-section of this section shall affect the amount of the "assessment for rating of any premises upon which any "fittings are or shall be fixed." There is protection here for the rating authorities.

The Junior Associations.

THE Junior Gas Associations have opened their winter's session with a splendid swing; and, with the enthusiasm that is everywhere apparent, we anticipate, with perfect confidence, that a good session's work will stand to the credit of the Associations when the record is again brought to a close. The wisdom of the organization of these Associations has been proved completely; and we are proud of the part that was taken by the "JOURNAL" in encouraging their establishment. We cannot say that the organizations, to use an ancient platitude of the advertiser, have "met a "long-felt want." The "want" was not "long-felt," because before the Manchester juniors came into organized existence, no one gave much thought to the juniors. This, however, may be claimed, that the Associations have in large measure filled a gaping blank; their members have justified their associated birth and existence, and have shown that behind the front rank of the profession there is solid material from which to draw. Those of the seniors who have in any way given their juniors countenance in this direction, have not only done a service to the juniors, but to the industry at large. They have been wise in the act; for to do anything to bring out the best qualities of the juniors, to give liberty for the expansion of those qualities, must produce improvement of intrinsic value. A chief engineer, however clever he may be, is after all only human. He is neither omnipresent nor omniscient. He has only one head, one pair of eyes, one pair of hands, and one pair of broad shoulders with which to deal with, and bear the burden of, responsibility that production, distribution, and competition bring upon him; and the more competent and the wider the experience and the knowledge of those who assist him, the greater is the reliance he is able to place in them—in fine, the better is it both for himself and the undertaking of which he is the responsible chief.

It has been remarked that these Junior Associations fill a blank. They do so. Our close observation of their proceedings, with a view to forming judgment, has convinced us that the members take their work very seriously. It has given them opportunities—opportunities for expanding experience, opportunities for friendly rivalry in debate, and opportunities for showing their virile interest in the profession of their adoption. It has encouraged the cultivation of those highly important educational essentials—such as observation and research, the study of the industry's literature, and the practice of committing views to writing, and of impromptu debate. Such exercise sharpens wits; and therefore we look upon these organizations as excellent adjuncts to the ordinary professional training, and as good training and recruiting grounds for the senior organizations. Time and space do not permit of pause to discuss here the effect of this preliminary training on the future of the Senior Associations; but if "coming events cast their shadows before "them," then the first-fruits in the way of papers and discussions in connection with the Junior Associations foretell many a fat harvest for the Senior Associations in the time to come. What the juniors are now enjoying was not feasible in the early professional days of those who are now the seniors. Let us impress this on the juniors, that those men who show themselves prudent and enthusiastic in taking advantage of opportunities, without egotism or assertiveness, are the men whom we shall anticipate seeing in the future attaining to the highest places in the gas profession. They are men of energy and enthusiasm; and of such must be the gas profession in the future.

There are, however, a few words of caution that we should like to utter. In the first place, the extension of liberty that has been granted to the juniors carries with it an obligation—an obligation to be strictly guarded in statement. Privately one or two engineers (that is all) have complained that things have been said by their assistants at meetings that they would rather have remained unpublished. And perhaps junior members have themselves left meetings recognizing that "Punch" is not the only place in which illustrations are found of things that "one would rather have "left unsaid" or that "one would rather have expressed "differently." Those, however, are of the early slips of the tongue, which have been agreeably few, and will disappear completely. But, speaking generally, both papers and discussions have displayed fine circumspection. There is one other word of advice; and that is not to overload papers and discussions by a too free quotation from text-books. But let all compositions and speech be of concentrated experience and judgment. A paper that is not of inordinate length and heavy will command more attention than one whose characteristics are of the contrary order.

In last week's "JOURNAL" appeared the first two addresses for the session delivered by Presidents of Junior Associations. The one was by Mr. G. W. G. Tatam, and the other by Mr. William Brown; their Associations being respectively the Midland Junior and the Eastern District of the Scottish Junior Association. To-day is published the address of Mr. J. M'Leod, F.I.C., of the Provan works of the Glasgow Corporation, to the members of the Western District of the Association. Mr. Tatam enlarged upon the greater association of chemistry and physics with industry—particularly the gas industry; Mr. Brown made a survey of the present condition of affairs in the gas industry, urged the necessity of proficiency, and gave many notes from his own practical experience; and Mr. M'Leod devoted his discourse to some highly instructive investigations into the scrubbing of coal gas, the problems connected with which process in gas-works operation have of late years been allowed to lie dormant. But offering a few remarks on Mr. Tatam's address, we are inclined to think that he has taken rather a narrow view of the extent to which chemistry and science have been applied to the work of the gas industry. Lest it should be thought, from what follows, that we are opposed to the association of the chemist with the practical work of gas making, let it be said at once that we have consistently favoured it, and do so now more than ever. The chemist is indispensable to the gas industry; but there are chemists and chemists. The chemists that the gas industry wants are those who have a practical twist of mind, and not those who are so enamoured of the refinements of the laboratory that they soar altogether above—to quote Mr. Tatam—"such essentials as cost, expediency, practicability, &c." We have had some of these gentlemen in past times bringing their refining influences on the gas industry; and it has taken years and years, much valuable time, and the expenditure of thousands of pounds in contest with inexorable opponents, to undo the trammelling mischief they wrought. But, on the other hand, the industry is largely indebted to chemists of practical mind for the solution of many important problems, and for helping to increase the efficiency of gas-works plant; and such assistance in engineering and process we hope will always continue. It is a meet companionship.

There is one other remark that Mr. Tatam made that needs example to corroborate it. He wrote: "Our com-"petitor in lighting has seen the advantage of scientific "thought, and has fostered it; while, except for some few "instances, the gas industry has given little encouragement "to the scientist, and is the worse for it." Certainly the improvement of lighting has become, and is becoming, more and more, the work of the chemist. For the gas industry, a chemist (whose name is imperishable) produced a marvellous success; but in the electrical industry, whose fostering of chemistry Mr. Tatam so much applauds, the refinements which created the Nernst, the tantalum, the osmium, and the tungsten lamps are of the category that are largely hedged in by impracticability. In other words, the lamps named have a certain limited scope, beyond which, so far as progress has been made at present, the refined condition of use that is required do not conduce to practicability. On comparing the

relative progress of the electrical industry and the gas industry over the past quarter of a century, we have an idea that, in penning the sentences quoted above, Mr. Tatam has gone a little astray, both in his understanding of what the gas industry has done in this particular matter, and in his reading of the comparative benefits that have accrued to the respective industries.

If, however, we wanted to illustrate the usefulness of a practical chemist upon a gas-works, we should not trouble to go out of our way to find anything better than the address of Mr. M'Leod. That address was, perhaps, on first acquaintance, somewhat above the heads of many of those who heard it; but it will not be after they have had time to study it. It is valuable for the new light it throws on the action of mechanical washer-scrubbers, and the effect the washing has—progressively, compartment by compartment—upon the carbonic acid, ammonia, sulphur, and hydrocyanic acid. It is a thoughful and suggestive piece of work that Mr. M'Leod has done; and it will reawaken interest in this branch of gas-manufacturing operations.

The Naphthalene Investigation of the Michigan Gas Association.

In another part of the present issue, we publish the first portion of a paper giving the results of the third year's investigation of the naphthalene problem carried out by Professor A. H. White and his co-workers under the auspices of the Michigan Gas Association. Like the previous contributions, it will be as heartily welcomed here as in the country of its origin. The first year's investigation, it will be remembered, consisted in the devising and working out of the necessary analytical methods for employment in the work; while in the second year attention was devoted to an investigation of the condensing and washing systems at a number of different works, with special reference to the removal of naphthalene. During the past year, the authors have chiefly confined themselves to a more detailed examination of one part only of the condensing system—namely, the Pelouze-Audouin condenser, and to the part which it plays in the removal of naphthalene from the crude gas. At the various works examined, this apparatus is placed between the primary and secondary condensers—that is, before the gas is completely cooled—this practice being the one commonly adopted on the Continent, but only rarely in this country.

From the results of their work, it appears that the Pelouze condenser not only removes from the gas the bulk of the tar suspended in the gas with its dissolved naphthalene, but also simultaneously effects the removal of a considerable proportion of the naphthalene present as vapour in the crude gas, although no fall of temperature takes place during the passage of the gas through the apparatus. The authors regard this reduction as due to the fact that, in removing the suspended tar, the latter is brought very intimately in contact with the gas, so that the former is enabled to exert its full solvent action on the naphthalene still present in the gaseous form. At most of the works examined, no naphthalene blocks occurred in the plant subsequent to the Pelouze condenser, when this was made to remove as much of the suspended tar as possible; but in the case of one works it was found, exceptionally, that if too much of the suspended tar was removed, stoppage from naphthalene took place rapidly in the secondary condenser, washer, and scrubber. Up to the present, the authors have not succeeded in determining the cause of the exceptional behaviour at this works.

As was to be expected in the case of so complex a subject as the condensation of coal gas, the theoretical views of the authors have not met with universal acceptance. One conclusion, in particular, which appeared to be contained in last year's report has been subjected to considerable criticism—namely, that hot tar is capable of removing naphthalene from gas more completely than the same tar when cold. In the present paper, the authors reply to some of these criticisms; but, in doing so, they seem to have misunderstood the exact nature of the objections raised to the above view. They regard them as directed against the supposition that hot tar is capable, under suitable conditions, of dissolving more naphthalene than when cold; whereas in reality most of the critics accepted this view, but regarded it as impossible that the gas in contact with the hot tar should contain less naphthalene than at a lower temperature. From a first perusal of Messrs. White and Barnes's present contribution, and the conclusions there given, it seems probable that, although the wording of last year's report may be given the above interpretation, this was not their intention, and that therefore there has been misunderstanding both on the part of the authors and their critics of the actual views of the other. A conference between both parties would probably result in the discovery that, in fact, their opinions on this matter were but little different.

The Background at Nottingham.

The feeling is spreading among the ratepayers of Nottingham that something is being kept in the background regarding the gas question, and that the powerful Liberal section of the Council have adopted a course of secrecy respecting the proceedings of the Special Investigation Committee for the purpose of shielding individuals. What is it that there is in the background that demands secrecy? If there is not something, then why all the warmth and persistency in urging that the personal side of the matter should be dropped and forgotten? Mr. Brown has been found guiltless of the charges brought against him. That this would be the issue of the inquiry, we were satisfied, from the moment that Mr. Councillor Harlow, the late Chairman of the Gas Committee, made his pusillanimous speech and attack in the Council last June. There was no hesitation on the part of the councillor in trying to sacrifice the gas engineer a few months ago; but there is a great deal of hesitation now in disclosing evidence that it is expected would spread before the public the real grounds for the antagonism to the engineer. If disclosure means the sacrificing of others, then they ought not to be spared by those in the Nottingham City Council who venerate honour and justice. The principal Nottingham Liberal paper is ardently urging that the people are sick of the whole matter, and that it should now be buried in oblivion. Such pleading from a political quarter of the same colour as those who displayed more eagerness than sense in their criticism of Mr. Brown, only gives weight to the opinion that there is something being hidden from the ratepayers of which they ought to know. What is it?

Pressing for Truth and Justice.

The matter ought not, in justice and in the interests of local government, to be allowed to rest where it is. It was fully believed in June last, that there would be a complete presentation to the Council of the facts as ascertained by the Special Investigation Committee; for Alderman Sir Joseph Bright then said "he understood there would be a special meeting of the Council, at which the whole of the facts, as ascertained by the Special Committee, should be considered; and Sir Joseph is a Liberal! What has transpired at the inquiry that there should now be a disposition to hush up the whole matter? The position is a disgrace to the Nottingham City Council; and we hope that Mr. W. J. Cecil Hayward (who was once a critic of Mr. Brown and of the "Journal," but now a friend, as our "Correspondence" columns to-day show), and others in Nottingham will do their utmost to keep the matter alive until truth and justice prevail. Mr. Hayward suggests a Board of Trade inquiry or that proceedings be taken in the High Court of Justice. A Local Government Board inquiry might be possible; but certainly the late Chairman of the Gas Committee and other prominent members of the Council have an opportunity of appearing in the Law Courts, if they desire to do so, to clear themselves—if it be possible—from the inferences that people will draw from the publication of the results of investigations that are being made by the "Nottingham Star," the Editor of which is still looking into "one or two other matters." The suggestions made by the "Star" are a further reason for the disclosure of the proceedings of the Special Investigation Committee.

Another Doubtful Prospectus.

"The list for applications is now open" for the Whitland and District Water and Gas Company, Limited; and our advice to investors is to allow it to remain open until the promoters of the concern are tired of spending their money in angling after that of the public. As the geographical knowledge of all our readers may not comprise Whitland, it may be mentioned that it is a

township in Carmarthenshire; and it is a township with "potential forces"—at least so it is stated in a puff article in the "South Wales Press," which article was apparently inspired by the promoters of the Whitland District Water and Gas Company. As the township is going to be made a "pivot of operations" (whatever that may mean), a water-supply system is wanted, and there is a "crying need" for a gas supply. For these purposes, this Company has been formed, with a share capital of £25,000; and the promoters (with a very fine show of modesty) would like to net at once, just by way of having something to be getting on with, £8000 in preference shares, £8000 in ordinary shares, and £3000 in first mortgage debentures—that is to say, £19,000 altogether. These debentures are secured as a first charge upon "the *whole* of the water and gas works and plant, rights and leases, and all other assets, also the gas and water revenue of the Company." This reads very prettily; but as all these things have a very unsubstantial look about them at present, the security is not particularly alluring. In the article already referred to, the lucrative character—one of the sops of modern gas prospectuses—of long-established gas undertakings is cited with tempting prominence. In being brought into comparison with a place at present without gas and water works, but containing such "potential forces" as Whitland, the Carmarthen, Cardiff, Swansea, Pontypool, Llanelly, and Pembroke Dock Gas Companies will doubtless feel highly honoured; but gas shareholders will by this time have become accustomed to this kind of thing, and will be warned by the appearance of the list. Some of the Companies named above were quoted in the celebrated Amman Valley prospectus; and in the Whitland prospectus we also recognize the names of individuals that appeared in the Amman Valley one and other documents since. The Water Works, Lighting, and Power Investment Corporation, Limited, with whom the principal contract is made, is also not unknown.

Who is to Gain?

It is this Water-Works, Lighting, Power, and Investment Corporation who are apparently going to absorb the greater part of the present issue of capital if the public will condescend to subscribe it. The contract of the Corporation with the Company (which contract is dated Oct. 8, four days only before the date of the prospectus) is for the construction of the reservoir, water, and gas-works, supplying and laying mains, leases of water rights, reservoir land, and gas-works site, in consideration of the payment of £12,500 in cash and an allotment of £2000 in shares, £500 of which are to be retained by the Company until the completion of the water and gas works. The £500 apparently refers to shares, and not to the hard cash. It will also be noticed that the agreement provides for the payment by the Company—not the Corporation—of the promotion and issue expenses, and legal and other fees incidental to the formation of the Company, which are not to exceed £2500, including expenses and brokerage and commissions. It will further be observed that the contract price has been certified by the Company's Engineer, who is also the Engineer of the Amman Valley Company. We have the opinion of a gentleman identified with gas engineering, and who knows Whitland, that if only £2000 was spent on gas supply for the town, a company might, by watching every sixpence, and exercising every possible care, get a return of 5 per cent. on the £2000; and therefore, including a gravitation water supply sufficient for Whitland, he regards the proposed capital as nothing short of outrageous.

Old Inducements.

As it will not take long to put down the little works necessary for the supply of the district, it will not be a protracted operation for the contractors to pay 5 per cent. interest on the shares, during the period of completion, and for twelve months afterwards if the revenue is insufficient to pay the dividend. After that, for the shareholders—if the capital now asked for is subscribed—there is likely to be a long unremunerative period. It is to be trusted that the clause in the prospectus giving applicants for twenty or more shares and debentures (if allotted) a preferential claim at par on the next issue (if any) of capital, will not create such a rush for the present issue that the promoters will be incommoded. It is also worthy of remark that, according to the Memorandum and Articles of Association, the qualification of a Director of this Company (which is, we suppose, to be one of the "potential forces" of Whitland) is the holding of shares or stock of the Company of the nominal and magnificent amount of £25. Perhaps, however, the holding is about commensurate with future responsibility. We hope so, at any rate. It is unnecessary to say that we cannot recommend this Company to investors; and it is equally unnecessary to say that the particulars in the prospectus leave a deep impression that the Water-Works, Lighting, and Power Investment Corporation, Limited, stand the best chance of getting the biggest plum out of the Company—if the public are so silly as to part with their money. The capital is altogether out of proportion to the requirements of Whitland.

The President of the Society of British Gas Industries.

This new Society has completed the task of setting its house in order; and it is now completely officered. With one exception, it has been so for several months. The exception was the President; and it is with much satisfaction we now learn that Mr. Dugald Clerk, M.Inst.C.E., F.C.S., has accepted the office. The fact that the Society has commended itself to Mr. Clerk, and that he has consented to take the proffered position, confers distinction on the organization. The members of the Society are to be congratulated. Mr. Clerk will preside at the meeting and dinner on Friday, Nov. 23; and at the former an address will, it is hoped, be delivered by a well-known architect. The Secretary (Mr. Arthur L. Griffith) informs us that full particulars will shortly be announced; but meanwhile he asks that members may be specially impressed to keep, if they can possibly do so, the afternoon and evening of Nov. 23 disengaged for the meeting and dinner.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 193.)

LAST week had a dull opening on the Stock Exchange. Withdrawals of gold (to which we referred in our last issue) inspired uneasiness; and Consols touched 86, but recovered later. The shyness regarding money movements continued to keep things down; and fresh business was repressed, partly by the more momentous settlement, and partly by a desire to await the Bank of England's action on Thursday. This, however, was fairly foreseen on Wednesday, when the German Bank raised its rate, followed by other kindred Continental institutions. When on Thursday the Bank of England rate was actually advanced, the relief from previous suspense was beneficial, and a decidedly more cheerful tone was introduced. This improved feeling was confirmed when it was found that the fortnightly settlement was completed without a block; and thus the week closed better than it opened. In the Money Market, there was a good supply to meet short loan requirements, and rates were not too onerous. Discount fluctuated somewhat; but at the close it was stiffening in view of further gold withdrawals. The advance in the Bank rate already alluded to was from 4½ per cent. (fixed four weeks previously) to 5 per cent.—a figure which has not been attained for several years past. Business in the Gas Market was quieter; but while the aggregate was lower, it was rather more fairly distributed through the list than it often is. Movements were irregular. The chief issue, for some reason or other, encountered some hostility; but most other stocks were firm. Gaslight and Coke ordinary was quiet at the first, but later in the week transactions were more numerous. The highest price marked was 99⅞ on Monday; and the lowest afterwards was 98½ (a fall of ½ in the quotation). The secured issues were quiet and unchanged. The maximum was done at from 89 to 90; the preference at 107 and 108; and the debenture at 84½ and 85½. South Metropolitan also was quiet and unaltered. Transactions ranged from 133¾ to 132. The debenture changed hands at 86 and 86⅜ (a fall of 1 in the quotation). Commercials were very quiet, with only two dealings in the 4 per cent. at 113⅜ and 114. The Suburban and Provincial group had about their fair share of attention. Brentford new marked 201⅞, ditto preference 121, British from 40½ to 41½, Tottenham debenture 104 and 104½, West Ham ordinary 105, and ditto debenture 103½ and 104. In the local Exchange, all three Sheffields had a rise. We have added quotations of Chester, Maidstone, South Shields, and Tynemouth to our Stock and Share List. The Continental Companies were unchanged. Imperial was done at from 186½ to 188; and European fully paid at from 24⅝ to 25. Union was not dealt in. Among the undertakings of the remoter world, Bombay was done at 6$1^{15}/_{16}$, Oriental at 153¼ and 153½ (a rise of 1 in the quotation), Cape Town at 15 and 14½ (a fall of ½), and Melbourne 5 per cent. at 101½ and 101¾. Primitiva ordinary was half-a-point up at from 7$1^{1}/_{16}$ to 7½, ditto preference marked 5$1^{3}/_{16}$, ditto debenture from 97½ to 98, San Paulo 14, and ditto debentures 50⅛.

The closing prices are shown in our Stock and Share List on page 193.

ELECTRIC LIGHTING MEMORANDA.

When the Lights are Low—Deficient Voltage and an Exemplary Fine—A Challenge—Some Figures to be Noted—Revival of the Question of the Transfer of Municipal Powers to Companies—Electric Motor Breakdowns.

ELECTRICITY consumers complain of the bad light they get from their lamps, station engineers accuse the lamps used of being the cause, and the manufacturers of the lamps accuse the station engineers of being at fault for supplying fluctuating voltages. Between them, the consumer has had the pleasure of paying up heavily for a value that he has not received, and at the same time has tried to frame a feeling that he has not been "done." One does not like to confess to having been "done" unless there is a way of prompt retaliation. Hitherto, generally speaking, electricity consumers have not appeared to understand that electricity suppliers are bound to furnish current at a specified pressure, with a liberal margin of safety for themselves below and above. Messrs. Mappin and Webb, Limited, however, are among those who have been aware of this; and they have brought the suppliers of electricity to their Oxford Street premises—the Marylebone Borough Council, whose electricity escapades have put upon them a great deal of very unwelcome notoriety—to book over their apparently incorrigible voltages. The trouble has been going on for months, until the firm's patience was exhausted by low illuminating power lights and the unsightly application of oil-lamps and candles. A pretty spectacle truly for a shop of such distinguished reputation as Mappin and Webb's to be illuminated in such heterogeneous manner! Five summonses against the Council for September were issued; and even this did not improve matters. The consequence was that further five summonses were taken out for days at the beginning of the present month. The firm was one of those who would not consent to the change over from 100 to 240 volts, which, it will be remembered, was one of the grievances of the electricity consumers in the district of the Marylebone Borough Council some time since. The firm's reason for not consenting to the change was that they were advised by their Electrical Engineer that the increased voltage would result in their having to pay probably 33⅓ per cent. more for light than they were then doing. This is an interesting point. However, Messrs. Mappin and Webb were apparently far too good customers for the Borough Council to pick a quarrel with, and so they continued to supply at nominally 100 volts; but, as a matter of fact, the voltage fluctuated between 84 and 95. The Borough Council, according to the reports to hand, had really no answer to the case; and they were fined £50 and £10 10s. costs. But Mr. Plowden consented to state a case on a point of law. Further details of the action will be found in our "Legal Intelligence." It is not likely that the Borough Council would have had this case made public if they could have avoided it. But it emphasizes the point that it is not always the consumers' electric lamps that are at fault when the lights are miserably low, and costs are out of all proportion to the value received. Electricity consumers ought to have these facts before them; and then Magistrates throughout the land would soon get acquainted with at least one part of electricity supply law.

The rash statements that are made by the purveyors of electricity as to the cost of domestic lighting compared with incandescent gas lighting deserve sharp treatment. The Ipswich Electricity Department have run their head into a noose by making derogatory statements concerning the Welsbach light. The act has met with a very practical proposition on the part of Mr. L'ce Fletcher, on behalf of the Welsbach Company—a proposition that has been made before elsewhere, but has never been accepted. Therefore we pray the Ipswich Electric Lighting Department not to show the same cowardly heels to the offer that others have done. Mr. Fletcher's proposal is as follows:

> I am willing, on behalf of my Company, to instal free of charge, through our agents, the Gas Company, a given house in Ipswich throughout with Welsbach-Kern burners and mantles, if the Electricity Department will instal a similar house on the same terms with electric light. The illuminating power to be equal, light for light, throughout twelve months, and to be the subject of four independent expert tests during that period. If at the end of the year the result does not prove that the Welsbach light for our house, allowing for mantle renewals at full prices, has cost less than one-fourth of the electric lighting account for their house, we will pay for their installation, and subscribe £25 to the local hospital. If the contrary, they are to pay for our house, and put up the like amount of money for the hospital.

Now, if the gospel of electric lighting as preached by the Ipswich Electric Lighting Department is based on Truth, they will gladly accept this offer. It will be noticed that, taking light for light throughout the twelve months, the cost of the Welsbach lighting is to cost one-fourth of the electric lighting account, under precisely like conditions; so that, judging from the published statement of the Electricity Department, they ought to have full faith in an easy win. They have an opportunity now of putting their statements to the proof in a manner that will interest the public, and bring credit to them—if they succeed.

There are several figures in Mr. Fletcher's letter containing the foregoing offer which may be useful to readers. He mentions that the latest type of burner, the Welsbach-Kern chimneyless burner, will do all that the old "C" burner does, with 25 per cent. less gas. The Welsbach-Kern burner was brought out in 1894; and it gives 75-candle power for 3 cubic feet of gas per hour, or, with Ipswich gas at 2s. 6d., 75-candle power for 300 hours for half-a-crown, including the consumption of the bye-pass. To get the same candle power with electricity, at 4d. per unit, the cost would be:—

	£	s.	d.
Incandescent electric lamp	1	13	4
Nernst electric lamp	0	16	8
Tantalum electric lamp	0	16	8

As to maintenance, the Welsbach Company guarantee that this shall not, under any circumstances, even for public lighting, exceed eight mantles per burner per annum; so that one could obviously have a new mantle twice a month in the lighting season, and still show an economy of about 28s. per lamp per annum, as against the electric incandescent, or about 11s. per lamp per annum as compared with the Nernst or the Tantalum lamp. This saving takes no account of the heavy cost of renewing the Nernst and Tantalum lamps, which would increase the electric cost figures by, at the very least, 10 per cent. per annum. Concerning the high candle powers, the following figures are correct for the Welsbach self-intensifying light:—

150 c.p. with bye-pass for 300 hours for	3s. 9d.
300 c.p. with bye-pass for 300 hours for	7s. 6d.
600 c.p. with bye-pass for 300 hours for	15s. 0d.
1200 c.p. for 300 hours for	30s. 0d.
2400 c.p. for 300 hours for	60s. 0d.

Around the decision in the litigation between the Sudbury Corporation and the Empire Electric Light Company, which formed the subject of comment in the "Memoranda" some time ago, a great deal of complication has arisen. The decision went against the Corporation, who were adjudged to have acted *ultra vires* by virtually parting with their electric lighting powers to the Electric Lighting Company without the consent of the Board of Trade. An agreement of the kind is expressly forbidden by the Electric Lighting Act of 1882; but, with a supreme contempt for Acts of Parliament, for the Board of Trade, and for legal decisions, local authorities have continued to consult only their own sweet will in this matter of parting with their statutory powers, until an opportunity has arisen for the central authority to pull them up sharply. We are generally a perverse people; but municipal authorities take an unqualified first place in respect of the characteristic. It is found that now Carnarvon and Bo'ness have run counter to the law; and the burgh of Hamilton are not disinterested observers of the course of events. The Bo'ness case is the one that is now to the front; and it has been brought into prominence by an application for £4000 over-expenditure in connection with the original scheme. The Council have, without special authority, practically transferred the whole of their business to the National Electric Construction Company, and have already advanced £2000 of the £4000 required to the Company. They are advised that the only way they can set themselves straight, and obtain the money over-expended, is by a Special Act, enabling them to lease the undertaking to the Company, who from the date of transfer must find the capital required, and pay the Council a rent to cover only the sinking fund and interest charges. The President of the Board of Trade—Mr. Lloyd-George—hails from the Principality; and he has encouraged the Carnarvon people to wait and see whether he can effect an agreement without putting them to the further expense of applying for a Private Act. The Bo'ness authority look upon this as hopeful for themselves; and they are sending their Provost to London to see what can be done. But even the President of the Board of Trade ought not to be allowed to abuse the common law. It was not long ago that the Board very properly took up an invincible attitude in connection with the traffic in electricity supply powers; and they ought to adhere tenaciously to the legal position, and not let friendship—political or otherwise—form a bridge over which the law can be violated. A Government Department ought surely to have an inflexible regard for the maintenance, and not abet the transgression, of the law.

The questions of the deterioration and unreliability of electrical machinery do not suffer loss of interest with time. The annual report of the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company, Limited (Mr. Michael Longridge, M.A., M.Inst.C.E.) is, in a section devoted to the insurance and inspection of electrical machinery, a sort of mirror reflecting facts and figures of much interest. Mere denial of electrical machinery being subject to rapid depreciation is impotent against actual occurrence. The year has brought to the Company another large increase in this branch of their business; the insurances current at the end of 1905 having exceeded the number at the end of 1904 by 16·7 per cent. But the tale of 1904 has to be repeated—the increase in the number of breakdowns was much greater (32·8 per cent.) than the increase of business. The amount paid in claims also largely increased—viz., 28·5 per cent. The explanation suggested in the report for 1904 was deterioration of electrical machinery by age and use; and Mr. Longridge is of opinion that the same explanation is applicable to a great extent to the experience of 1905. At the same time, he thinks the heavier fuses which the Company have been compelled to allow to meet the heavy starting currents required by motors in so many cases are not without influence on the rate of breakdown. This rate among dynamos is decreasing; but among motors—particularly small motors—it is increasing, and somewhat rapidly. In 1905, it was no less than 1 in 8, which

means that every eighth motor insured broke down during the year. Among dynamos the rate was lower. The rate among continuous current motors exceeded that among alternating current motors by 40 per cent.; while the rate among alternating current dynamos exceeded the rate among continuous current dynamos by 29 per cent. From the tabular matter, the causes of the breakdown of motors are divided as follows: Accident, 9 per cent.; dirt and neglect, 19 per cent.; age and deterioration, 25 per cent.; bad workmanship and design, 18 per cent.; overloading, 2 per cent.; unascertained, 27 per cent. "Age and deterioration" and "bad workmanship and design" are heavy items; and the item "dirt and neglect" suggests incompetent attendance.

A STRANGE CASE OF THE SALE, PURCHASE, AND RE-SALE OF A GAS-WORKS.

VERY shortly the proprietors of the Blyth and Cowpen Gas Company will be called together for the purpose of confirming a resolution already passed, authorizing the Directors to enter into negotiations with the "proprietors" of the Bedlington Gaslight Company, Limited, for the purchase of their undertaking as a going concern; and, if successful in arranging the said purchase, to forthwith proceed with a Bill in Parliament to seek powers to acquire the undertaking, to extend the limits of the Blyth Company's supply, and to generally include in the Bill any recent "Acts" relating to the gas industry which might be to the interest and benefit of the Company. The proprietors of the Blyth Company do not appear to possess a great deal of inquisitiveness among them, or they would inquire of the Directors, Why all this haste? But before they proceed further in this matter, we do suggest to them that there are a few points to which they should give consideration, and upon which a little explanation should be demanded of the Directors. It is not our intention to impute motives to anyone; but we may present facts, ask whether certain things are true, and inquire as to whether the time is altogether opportune for the promotion of a Bill in Parliament.

The latter point may be dealt with first. It was only in 1904, the parliamentary records of the "JOURNAL" inform us, that the Blyth and Cowpen Company were in Parliament, and obtained an up-to-date Act. In the proposed Bill, it is contemplated to include "any recent Acts relating to the gas industry which might be to the interest and benefit of the Company." There are only two matters, in recent gas legislation, for which it would be useful for the Company to approach Parliament—if they were quite sure they could do so without harm, which is at the present time questionable. These two matters have regard to the release from the obligation to purify for sulphur compounds (the Company being, by their Act of 1887, restricted to 20 grains, tested at the works quarterly), and to the adoption of the Metropolitan No. 2 argand burner for testing, in place of the so-called "Wandsworth" test-burner, which was prescribed in 1904. It is somewhat singular that in the 1904 Act, there was not a provision inserted, allowing of the adoption of any new test-burner approved by the Board of Trade. If there had been, the new burner could have been immediately brought into use. However, these are, in our judgment, the only two matters that are of any importance; but it cannot be said, so far as the Blyth Company are concerned, that they are in any wise urgent. The Company had the opportunity of joining in the Gas Companies' (Removal of Sulphur Restrictions) Bill in this very session. They did not see fit to do so; but if the Directors are more impressed now with the necessity of getting quit of the trouble of sulphur compounds, there may be another early occasion for doing so, by the economical process of joining in a second combined application to Parliament. And as to the test-burner for 14-candle gas, the "Wandsworth" burner is perhaps the next best to the Metropolitan No. 2 burner. Under the circumstances, we do not find there is any immediate necessity for approaching Parliament, apart from the proposal to purchase the undertaking of the Bedlington Gaslight Company; and we are not sure that there is sufficient prospective profit to be obtained from this purchase to run the risks that have at the present time to be encountered by private enterprise in Parliament. Municipalization is rampant in the House of Commons as at present constituted. In the last session, there was a case of compulsory purchase of a gas undertaking allowed; and two Companies have had their newly-gained powers suspended until it is seen whether the Local Authorities promote Purchase Bills in Parliament in the coming session; and then, if they do, the suspension continues until the fate of the Purchase Bills decides whether or not the gas supply in the towns in question is to be conducted by the respective Companies or by the Local Authorities. Unless requirements are exigent, we do not consider the present a favourable time for gas companies to go to Parliament.

But what has happened, that the Bedlington undertaking has, since the Blyth and Cowpen Company were in Parliament two years ago, become such an eligible property for the latter to buy? It is certainly not the present material condition of the Bedlington Company that causes it to be a desirable purchase; for last year, we believe, the total output of gas was only 3,400,000 cubic feet, the number of consumers 150, and the price of gas 5s.; and the houses are straggling over an extensive area, which will go against the economical development of business there. The desirability of purchase does not protrude strikingly from the above facts. Looking farther into the matter, it is remarked that the notice convening the meeting of the Blyth and Cowpen Gas Company—at which the Directors were authorized to enter *into negotiations with the proprietors* of the Bedlington Gaslight and Coke Company for the purchase of their undertaking, and, *if successful in arranging the said purchase*, &c.—was dated Aug. 13 last. It is found by a little consultation of documentary evidence at the Companies' Registration Office that on Aug. 8 (only five days before the notice convening the meeting of the Blyth and Cowpen shareholders was dated) a return of allotments was made (in accordance with section 7 of the Companies' Act of 1900) of the Bedlington Gaslight Company, Limited; and the return was registered on Aug. 9. The return is interesting. It refers to the allotment of 500 shares in the Bedlington Company; and the allottees only number seven. Six of them hold an equal number of shares—83 each; and the balance of 2 are the property of a solicitor's clerk. But of the six allottees, it is seen that four are Directors of the Blyth and Cowpen Company, the fifth we believe is the Solicitor to the Company, and the sixth is the Secretary. The Chairman of the Blyth Company is the only Director who does not hold shares in "the syndicate of local gentlemen" who think it will be a good thing if the Blyth Company take over the Bedlington concern "if a price can be arranged." It will thus be seen that the Directors have been authorized to enter into negotiations with four of themselves, their own Solicitor, and their paid Secretary. Under such circumstances, there ought not to be much difficulty about "arranging the said purchase." It is believed that the price that was paid by the Company so composed for the Bedlington property was £2700. The nominal capital shown by the return is £5000; and a flying rumour puts the price to be "negotiated" at £4000, with the whole of the costs incidental to the above proposals to be packed on the back of the Blyth and Cowpen Company.

On the face, it does not appear, if the purchase is effected by the Blyth and Cowpen Company, that it will be altogether a prudent one. Supposing the £4000 is correct, and on top of this has to be placed all expenses incurred in connection with the purchase and transfer and the obtaining of an Act of Parliament. It looks, roundly, like a £5000 matter; and on the present consumption in Bedlington it would represent a capital of between £1400 and £1500 per million cubic feet, which, to say the least, is ridiculous. If the Blyth Company have money to spare for development, perhaps it could be better utilized nearer home, and in a more profitable manner. However, the subject may be left here for the present. If the £4000 mentioned above is confirmed—the sellers and the Directors of the Blyth Company being practically the same—there may be occasion to revert to the matter.

OBITUARY.

Mr. WILLIAM CLAPHAM, Chairman of Clapham Bros., Limited, gas engineers, of Keighley, and the last survivor of the three brothers who established the business, died last Wednesday, in his 82nd year. Deceased took more than his share of public work, as he was for some thirty years a member of the Keighley Board of Guardians, during which period he was six times elected Chairman. The funeral took place on Saturday, in the presence of a large gathering.

The death took place on Sunday afternoon, at his residence Coombs Bank, Kingston Hill, Surrey, of Sir RICHARD TANGYE, Chairman of the well-known engineering business of Tangyes Limited, of Birmingham. Deceased, who was 73 years of age, took a situation as clerk in a small engineering establishment in Birmingham when he was about 18; and after remaining there for a few years, he started business on his own account. He was created a Knight in 1894; and he was a J.P. for Birmingham and for Warwickshire and Cornwall. For some years he was a member of the Birmingham Town Council; and the Municipal Art Gallery and School of Art owe much to his munificence.

Recent Wills.—The will has been recorded of Mr. James M'Gilchrist, who for 33 years held the position of Gas Engineer and Manager to the Dundee Corporation, and who died on the 18th of May last, as notified in the "JOURNAL" at the time. The Trustees are Mr. Robert Mackay Sutherland, of Falkirk, chemical manufacturer; Mr. James Morton, works manager; Mr. John M'Farlan, of Helensburgh, grain merchant; Mr. John Aitken, of Grangemouth; and Mr. John M'Gilchrist, of Gourock, gas manager. They have valued the testator's personal estate at £13,356, including £1150 as his interest in the firm of M'Farlan and M'Gilchrist, house proprietors; £2000 in shares of Messrs. John Stewart and Co., Limited; £2500 in shares of Messrs. James Milne and Son, Limited; and £2500 in shares of Messrs. Kerr and Co., Limited. The will of the late Alderman Arthur Currer Briggs, of Leeds, the well-known Yorkshire coalowner, whose sudden death was announced in the "JOURNAL" for the 4th ult., shows that he left £96,311. The late Mr. James Macrosty, who was Secretary of the Crieff Gas Company, left personal estate of the value of £68,476. The late Mr. T. G. Turner, the Secretary of the Berwick and Tweedmouth Gas Company, left £3252.

THE NEW WORKS OF THE EDINBURGH AND LEITH GAS COMMISSIONERS.

Opening of the Second Section.

THE second section of the new gas-works of the Edinburgh and Leith Gas Commissioners at Granton was opened yesterday afternoon in auspicious weather. The company, to the number of more than 150, travelled by special train on the Caledonian Railway into the works at the Commissioners' private station, in which they were met by Mr. W. R. Herring, M.Inst.C.E., Chief Engineer and Manager, and the members of the staff. Among the company were Mr. A. Wilson, of Glasgow, Mr. A. Yuill, of Dundee, Mr. S. Milne, of Aberdeen, Mr. W. Ewing, of Greenock, Mr. W. B. M'Lusky, of Perth, and ex-Bailie Calderwood, of Glasgow. The works were gaily decorated with flags.

Assembling on and beside the stairs at the south end of the exhauster-house, the Rev. T. Smith Goldie, the Parish Minister of Granton, opened the proceedings with prayer. Lord Provost Cranston, as Chairman of the Gas Commissioners, presented Lady Cranston with a gold key, with which her ladyship unlocked the door; and, having opened it, she said she declared the second section of the important works open. Lady Cranston then unveiled a bronze tablet in commemoration of the event.

Judge Bryson, of Leith, the Convener of the Works Committee of the Commissioners, narrated the procedure in connection with the construction of the works, and said the result had been the beautiful works on which they were assembled. Several improvements had been made in the second section. The retort-house was 10 feet wider, and this space had all been devoted to the carbonizing department, which went to give extra comfort to the workmen. The second section was only half filled with carbonizing plant; and they felt, considering the rate of increase which had taken place in the consumption of gas during the past two years, that they would not require to put down more plant for about five years. The architectural designs and engineering work of construction he thought reflected the greatest credit on their Engineer, who had attended to the whole work, even to the minutest detail. He had great pleasure in asking Mrs. Mackie, the wife of the Provost of Leith, to accept a gold bracelet as a *souvenir* of the occasion, and to unveil the bronze tablet in commemoration of the construction of the second section of the works.

The tablet having been unveiled and the company photographed, the party inspected the works, and then luncheon was served in the technical office—Lord Provost Cranston presiding.

At the close of the repast, Lord Provost Cranston, addressing Judge Bryson, said the Commissioners believed there was a deep debt of gratitude to him for what he had done in connection with the works; and he was directed, on behalf of his colleagues on the Commission, to ask his acceptance of a silver cigar-box. He had much pleasure in doing this, because Judge Bryson had devoted so much of his time and attention to the work.

Judge Bryson, in acknowledging the gift, said he did not know how to thank the Lord Provost and his colleagues for this kind expression of their esteem and confidence in him. He assured them he appreciated it very highly.

Mr. J. Cowan, the ex-Master of the Merchant Company, proposed the toast of "The Corporations of Edinburgh and Leith." He congratulated them on the splendid gas-works of which they were now in possession. He did not hesitate to say that the Corporations had never before put their hands to an undertaking which had been carried out so successfully as the gas-works they were assembled to open. He did not doubt at all that the works would pay well. Whenever they had a business conducted on good business lines, with a good business man at its head, they always found it paid. They had started the works on good business lines, and had placed a good business man at the head of them, and gave him a good deal of rope, with the result that to-day they had excellent gas-works. He coupled with the toast the names of Lord Provost Cranston and Provost Mackie. They in Edinburgh could not but have feelings of regret that their genial Lord Provost, Sir Robert Cranston, was going out of office. He had certainly proved himself a most excellent occupant of the office. Provost Mackie was not relinquishing office, but was going in for another term, in which he would have opportunity of doing excellent work.

Lord Provost Cranston, in responding, said they were exceedingly proud of such an excellent gas organization as they had. He thought the citizens were under a deep debt of gratitude to Mr. Herring. Some people said they ought not to be led by the nose by their permanent officials; but so long as they had an able man, and an honest man, at the head of affairs, he thought they should all be led by him. There was a class of people who grudged the salaries that were paid. No man could be paid too much who devoted his whole interest to an undertaking. He was quite prepared to say that the salary paid to Mr. Herring was not equal to 5 per cent. on the £600,000, the cost of the works, which they would have paid if there had been an architect upon the work; and he said Mr. Herring was worth double this sum, having regard to the economy and efficiency he had shown. He (the Lord Provost) wanted councillors who were there that day to go to their ward meetings and tell the public the absolute facts of the case. There were men talking at random about the extravagance of corporations. Who were they? They were men, in the first instance, who knew nothing about the subject; and, in the second place, they were people of the worst class to put in power—men who had no ideas of economy, but who sought to pander to one particular class. He and his father had been connected with Corporation work in Edinburgh for sixty years; and they had always found it better not to pander to any class, but to follow straight in the line of that which was best for the whole city and for the welfare of the great majority. In saying "good-bye" to the Gas Commission—for he should not have the pleasure of seeing them again—let him say this, that he was deeply indebted to them for the great courtesy they had shown him.

Provost Mackie also responded. He said he could assure those present that it had been a very great pleasure to him to be there, and to congratulate Mr. Herring on the completion of the second section of the works. He felt in regard to the ability Mr. Herring had displayed, and to the question of remuneration which had been raised at several ward meetings, that they had done right; because if Mr. Herring had been paid his original salary and commission on what he had done, he would have had far more than he had received.

Judge Grieve proposed "Kindred Gas Undertakings." He said there had been healthy rivalry between these undertakings, but also a disposition to give every information possible by one to the other. This was as it ought to be. Before the Gas Commissioners requested Mr. Herring to prepare plans for the works inspected that day, they went through England and Scotland to see what was to be seen; and they remembered the kindly reception they met with on all hands. The good feeling which existed among gas corporations was more recently exhibited in the combination among a number of leading corporations with reference to the regulations proposed by the Home Secretary in connection with railways in factories. This combination was a marked success, and resulted in great saving to the corporations.

Ex-Bailie Calderwood, of Glasgow, in responding, at the outset thanked the Gas Commissioners for their kind invitation to the opening of the second section of the magnificent gas-works they had inspected. He thought no higher honour could have been done to the Lord Provost before his retirement than to ask Lady Cranston to open them. He had gone over them with Mr. Wilson, the Manager in Glasgow, who had had a good deal of experience in the manufacture of gas and the construction of gas-works; and he must say, as one quite familiar with the gas-works in Glasgow, that he was struck with the arrangement of those at Granton, where every consideration had been given to detail work. He observed in the construction of their producers the amount of light and air which was there, and which would make the conditions of life more comfortable. He was very glad to know that in Mr. Herring they had a splendid engineer. He came in contact with him once or twice when considering the regulations of the Board of Trade; and he thought the Corporations owed a great debt of gratitude to him for the work he did on that occasion. The gas industry was a very important one. In Glasgow, they were going on from step to step. Last year they sold 255 million cubic feet of gas more than they did in any previous year. The Electricity Department had run them very hard. They were going to meet them with an improved incandescent burner, and they were going to meet them in the matter of pounds, shillings, and pence in a way that department would not look at. The public health was a very important department; and he thought that in the manufacture of gas they had to some extent contributed to the public health, because if they had better light the community could do their work better, which ought to be the aim and object of all corporations.

Lord Provost Sir Robert Cranston proposed "The Health of Mr. Herring." He said he should like to explain that the works had cost close upon £600,000. If an architect had been employed, his fee would have been 5 per cent. on the cost, or £30,000. This £30,000 at 5 per cent. would amount to £1500. The economy they had effected he really believed amounted to £40,000 or £60,000, apart altogether from commission. Therefore Mr. Herring stood in the position of costing the Gas Commission nothing to-day. He was sure all who went through the works would feel that, apart from salary, they owed Mr. Herring a deep debt of gratitude.

The toast having been enthusiastically honoured,

Mr. Herring, in response, said, on behalf of the other officials who had been referred to, and on his own, that they thanked the Lord Provost for his kind remarks in proposing the toast, as well as the company for the hearty manner in which they had received it. He could assure them that the officials had worked, and did work, with singleness of purpose in the interests of the gas undertaking. They were that day celebrating a somewhat unique event. It was not often that a man placed in the position in which he was ten years ago found it necessary to condemn all that then existed. The condemnation, however, was coupled with the suggestion that it would be commercially advantageous to do as was then indicated, and, to use an American phrase, "scrap the lot." They did, as those present knew, practically "scrap the lot;" and it must be very gratifying to the Commissioners past and present to know

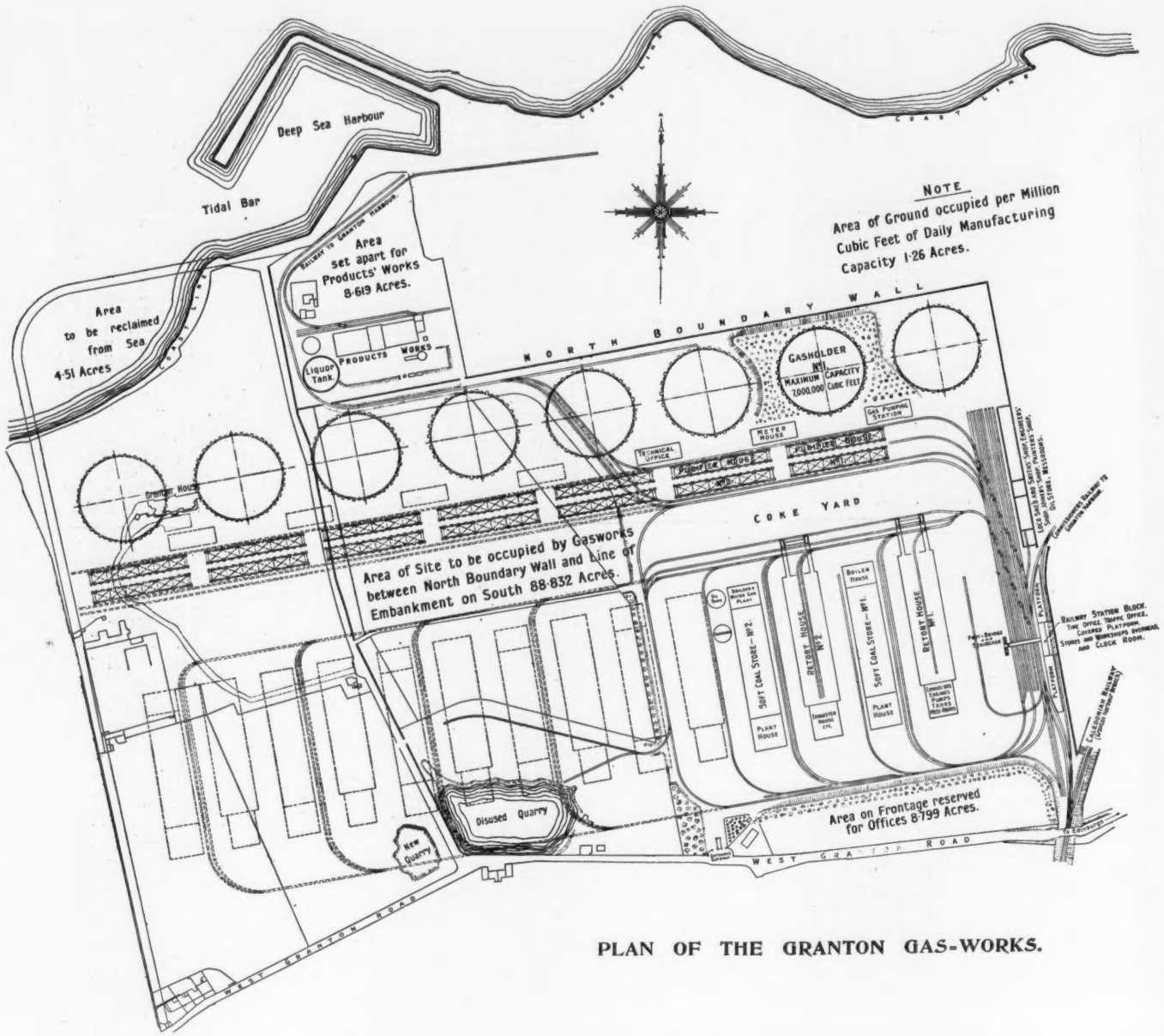
that the scrapping had not cost the citzens a penny. On the other hand, they were receiving a very considerable sum per annum as a consequence of the bold policy which was instituted now nearly ten years ago. It would, of course, be out of place if he were not to express his gratification at the conclusion of that policy, with the initiation of which he had something to do. He told them candidly that he felt honestly proud the conclusion was so successful. They had endeavoured in the construction of the new works to show that gas-works need not be the dirty black hole which many of them knew them to be in most towns. The improvement in the appliances and the application of science had rendered their business a much more simple and more scientific one, and one which could be carried out in the midst of a community, without nuisance and without objection. He sincerely thanked them for the very kind remarks which had fallen from so many speakers; and, on behalf of himself and his colleagues, he could only say that it was their intention in future, as in the past, to serve the public to the best of their ability.

Bailie Menzies proposed "The Health of the Lord Provost," who briefly replied; and the proceedings were brought to a close by the singing of "Auld Lang Syne."

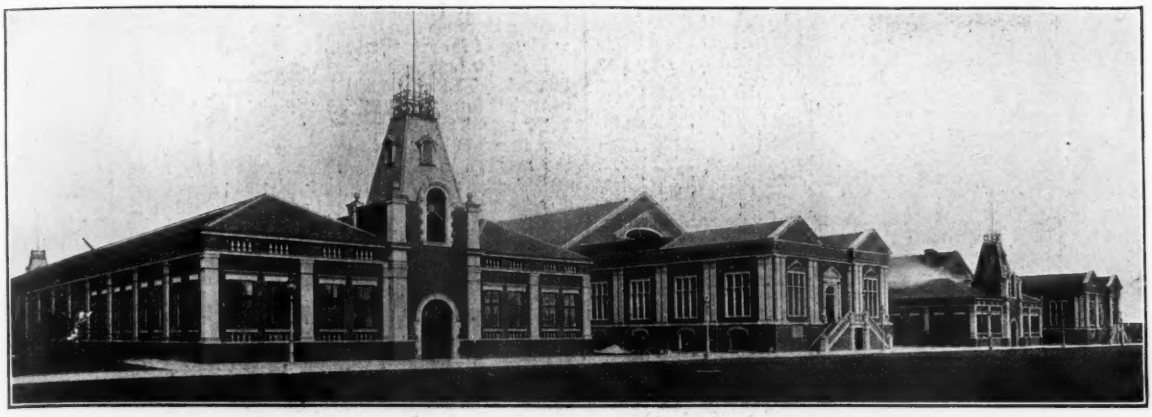
THE GENESIS OF THE NEW WORKS.

The circumstances which led the Commissioners to undertake the erection of the very fine works at Granton, the formal opening of the second section of which was celebrated by the proceedings of which we have just given an account, will be in the recollection of a large number of our readers; but they may be briefly recapitulated by way of preface to the description of the new portion which was inaugurated yesterday. This we are enabled to do from a pamphlet specially prepared for the occasion by Mr. Herring, and distributed among the visitors.

During the winter of 1896-7, the manufacturing plant at the various works of the Commissioners was employed to its utmost extent to meet the public demands for gas; and the state of things was such that a slight mishap must have resulted in a serious depletion of the supply. This necessitated a thorough investigation into the conditions and capacities of the respective plants, with a view to ascertaining in what way the supply could be rendered more certain, and the increasing demands properly met. This formed the subject of a special report by the Engineer in September, 1897, in which it was pointed out that the Edinburgh and Portobello works were both producing to their utmost capacity, and that the entire area was fully occupied with plant in a most congested condition, which rendered the winter work a problem of the greatest difficulty, and the supply to the public very precarious. The Leith works were, if possible, in even a worse plight—more

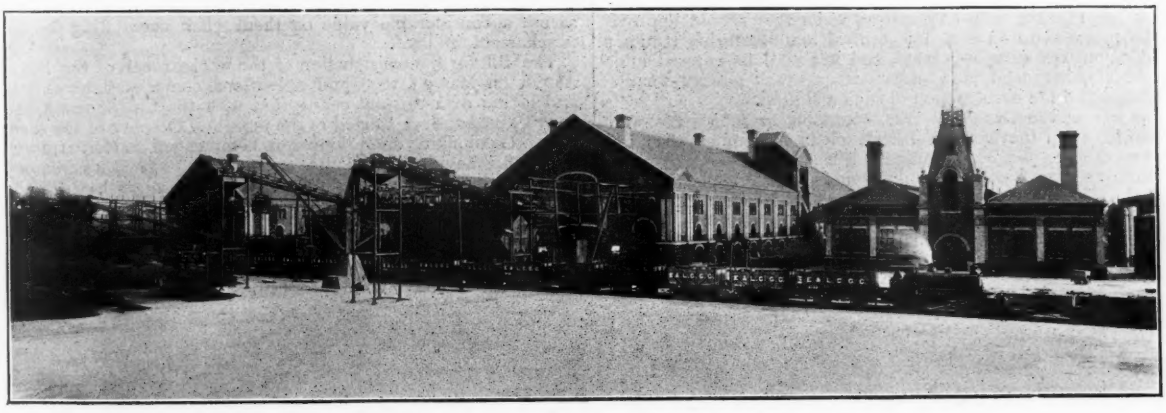

Deep Sea Harbour
Tidal Bar
COAST LINE
NOTE
Area of Ground occupied per Million Cubic Feet of Daily Manufacturing Capacity 1·26 Acres.
Area set apart for Products' Works 8·619 Acres.
Area to be reclaimed from Sea 4·51 Acres
PRODUCTS WORKS
Liquor Tank
NORTH BOUNDARY WALL
GASHOLDER No1
MAXIMUM CAPACITY 7,000,000 CUBIC FEET
GAS PUMPING STATION
METER HOUSE
TECHNICAL OFFICE
COKE YARD
Area of Site to be occupied by Gasworks between North Boundary Wall and line of Embankment on South 88·832 Acres.
SOFT COAL STORE—No2.
RETORT HOUSE No2.
BOILER HOUSE
SOFT COAL STORE—No1.
RETORT HOUSE No1.
PLANT HOUSE
Disused Quarry
New Quarry
Area on Frontage reserved for Offices 8·799 Acres.
WEST GRANTON ROAD
CALEDONIAN RAILWAY (EDINBURGH & DISTRICT)
RAILWAY STATION BLOCK. TIME OFFICE, TRAFFIC OFFICE, COVERED PLATFORM, STORES, AND WORKSHOPS OVERHEAD, AND CLOCK ROOM.

PLAN OF THE GRANTON GAS-WORKS.

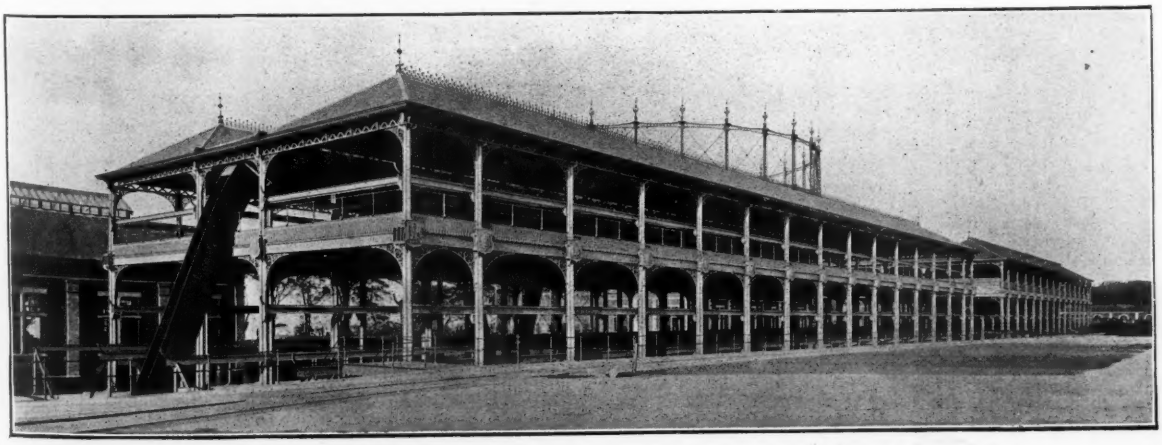


General View of Works Looking North-East.—South Front Elevation to Main Road.

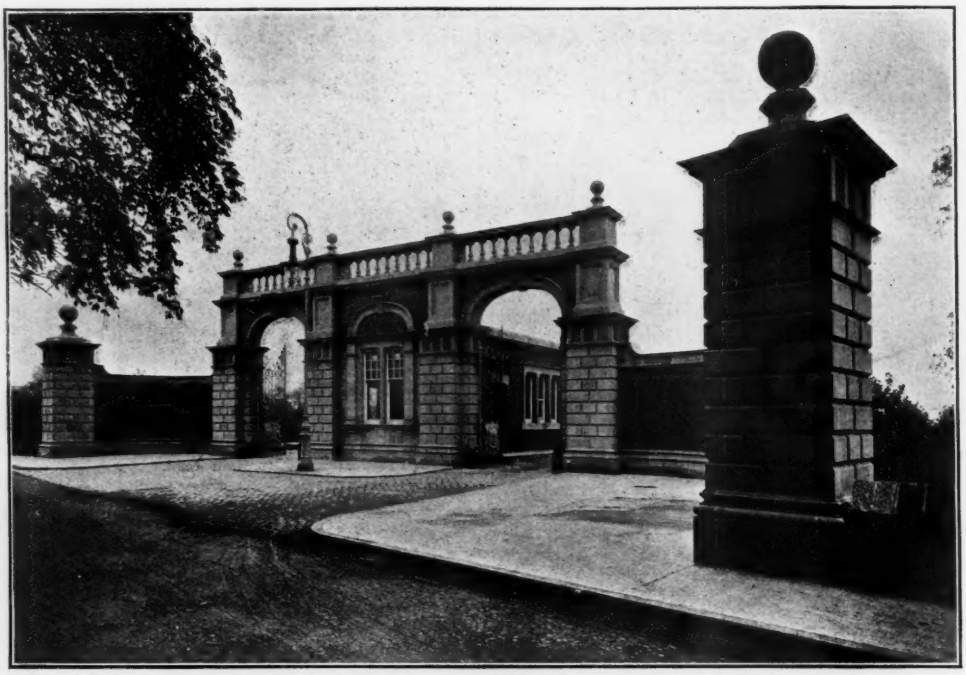
General View of Works Looking North-West.—South Front Elevation to Main Road.



General View of Coke Yard, Coke Screening, Storing, and Loading Plant.—North Elevation



Purifier Houses with Plant and Overhead Floor for Revivification of the Material.

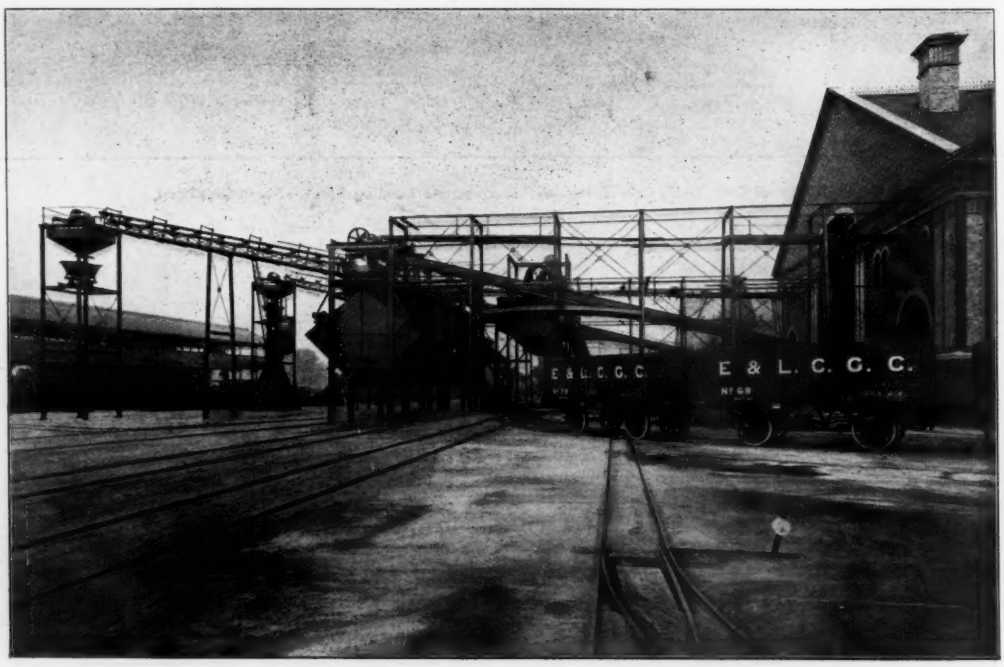


Entrance Gateway and Weighbridge Office for Cart Traffic from Main Road.

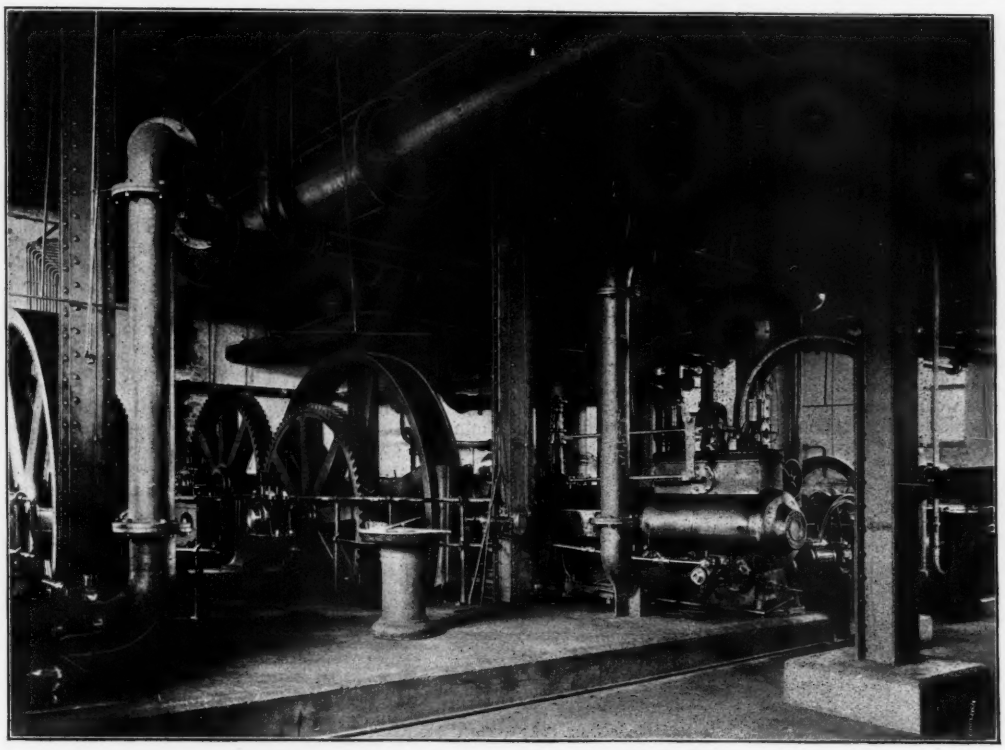
congested, indifferently planned, and insufficiently equipped with appliances for properly treating the gas which the producing plant was capable of yielding. The then existing works were reported to be not only incapable of meeting the increased consumption, but in many respects ill-adapted to modern circumstances. In fact, the whole of the manufacturing stations had arrived at that stage of their existence when a complete reconstruction was imperative; and the questions that had to be considered were the relative advantages and economy of pulling down the old and reconstructing new works, on the then existing sites, or the acquisition of land whereon plant and works of the most modern description to meet present-day requirements could be erected. The Commissioners wisely determined, after the most mature consideration, that the time had arrived when they should approve of the proposal to have a new central manufacturing station; and Committees were appointed, and negotiations entered into, for the acquisition of land and parliamentary powers for its purchase, and the construction of such a station.

The site of the Granton works, extending to 106¼ acres, was purchased from the Duke of Buccleuch in November, 1897, for the sum of £124,000, which included a right to reclaim 4¾ acres of foreshore; the laying of a railway and its practically free use from the Granton Harbour to the eastern boundary of the works (about half-a-mile), together with the use of the harbour railways for their own traffic to and from the harbour and all their traffic running in connection with the North British Railway system; the right to tip carbonized refuse on the foreshore; the building of a jetty or a harbour; and other facilities which represented a considerable monetary value to the Commissioners. The eastern boundary was fixed so as to admit of a direct junction with the Caledonian Railway system. The commercial conditions, therefore, of having two railways in opposition, and water-borne traffic in competition with both, were probably unique in the history of such works, where traffic to the extent of nearly half-a-million tons per annum is manipulated; and its financial advantages were of such importance that the Commissioners were able to assess a considerable value on them when negotiating for the purchase of the land.

The Bill for the construction of the works received the Royal Assent on May 23, 1898, and operations, comprising the cutting and laying of a railway connection with the Caledonian Company's system, were started in the month of October of the same year. Gas-making operations were commenced on Oct. 21, 1902; and up to the middle of February, 1903 (the opening ceremony taking place on the 27th), 52,300 tons of coal were used for the production of gas. From the commencement to the 30th of



Hot-Coke Conveyors, Quenching, Storing, Screening, and Loading Plant.

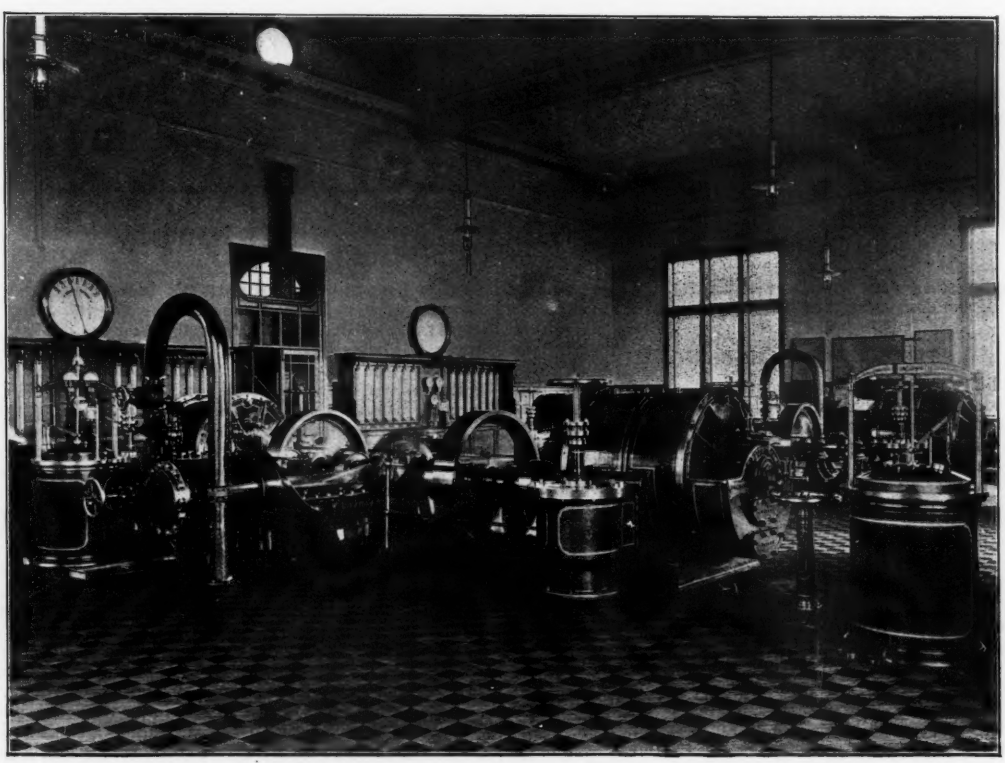


Power-House for Driving the Coal Unloading, Breaking, Elevating, and Storing Plant, and the Hot-Coke Conveyor, Screening, and Loading Plant.

September last, 640,468 tons of coal have been used for the production of gas on the works. The estimated cost of their construction was stated by the Engineer to be at the rate of £45,000 per million cubic feet of daily producing capacity—an estimate which was confirmed by Sir George Livesey in his evidence before the Parliamentary Committee who considered the Commissioners' Bill. It is therefore gratifying to be able to record the fact that the first section of the works was completed at the rate of £42,000 per million cubic feet; and there is every reason to believe that the second section, which it was estimated would cost £200,000, will be completed within the estimated expenditure. Up to May 15 last, a total of £769,642 had been expended upon the land, works, and other constructions.

After the works were in operation, the economies resulting from their use were found to be not only sufficient to pay interest and sinking fund charges upon the capital outlay, but also, with even an increased rating to the operatives, it was possible to reduce the price of gas by 3d. per 1000 cubic feet to the consumer, lower than it had ever been before—a reduction representing a sum of £23,500 per annum. The scheme which the Commissioners embarked upon has therefore been fully justified by the commercial results that have accrued, apart altogether from the question of amenity, and the removal of the three manufacturing stations from the centres of habitation. The second section was determined upon in order to permit of the absolute cessation of gas-making operations at the Edinburgh works; the Leith and Portobello works having already been dismantled.

The first section of the works—of which, it may be remembered,

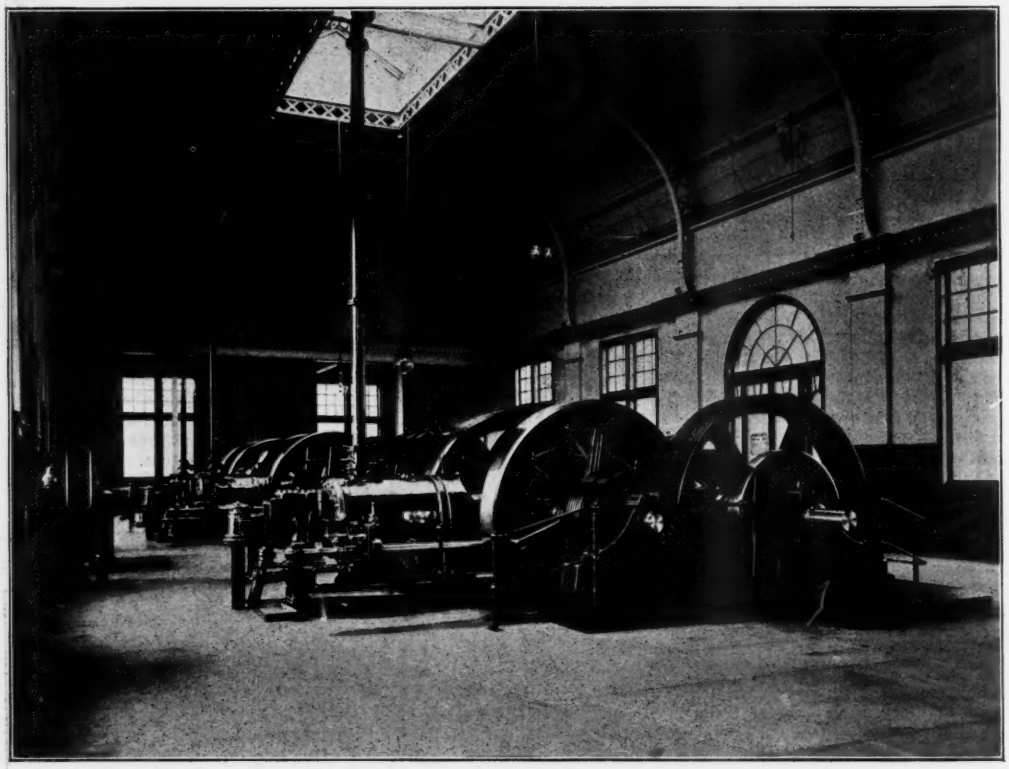


Exhauster and Governor Room.

a full description was given in a series of articles, specially written by Mr. Herring, which appeared in the "JOURNAL" between January and July, 1903—was of sufficient capacity to meet the maximum winter demands; but was not designed to carry the reserve that was necessary to deal with excessive demands, owing to severe weather, in the winter season. It was thought that the New Street works might be held, at least for a time, as the station in reserve to meet such contingencies. However, the great success of the Granton installation as a labour-saving device rather altered the complexion of matters; and the natural desire of the Commissioners to free the city of the incubus of the works in the locality in which they are, influenced them in determining, on Nov. 30, 1902, to proceed with the second section, and equip it with such plant as was considered necessary to make the Granton station capable of meeting any possible demand that might be made upon it in the most severe weather.

In designing the second section of the works, the scheme originally laid down has been closely followed—that is to say, that each section is to form a self-contained gas-works, and be independent in its working and internal arrangements. The traffic arrangements also in connection with each section are free and unimpeded by the operations of any other section. So far as the plant itself is concerned, substantially the same type has been introduced. There are, however, many important improvements in the mechanical details which experience and use have shown to be advantageous, and which will unquestionably tend to still further increase in a marked degree the economy and successful working of the installation.

It is now four years since the first section of the plant was set to work. The coal used has realized an increased production over that formerly obtained at the old works; the Granton figures being 10,438 cubic feet per ton in 1904, 10,802 cubic feet in 1905, and 10,973 cubic feet in 1906, as compared with 10,253 cubic feet, the average in the former years. The labour costs, with wages on a higher scale, are remarkably low, as will be seen from the statements to be found on pp. 163-5. The entire costs for the year 1904, under the heading of carbonizing—including wages for foremen, discharging coal, attending to coal-breakers, elevating, conveying coal to the bunkers, charging and drawing retorts, attendance to the mouthpieces, cleaning and repairing retorts, greasing machinery, furnace attendants, hot-coke conveyor, and enginemen attending to the machinery—were 1·482d. per 1000 cubic feet; in 1905, 1·3d.; and in 1906, 1·28d. The second section of the works is equipped with an inclined-retort carbonizing plant, capable of dealing with 500 tons of coal per diem, together with automatic coal unloading, breaking, elevating, and storage plant, hot-coke conveyors, screening and loading plant, ash-handling plant, water-tube condensers, water-tube boilers, steam-driven gas-exhausters, Pelouze and Audouin condensers, a Livesey washer, scrubbers and cyanide plant, together with a set of six



Pumping Appliances for Propelling Gas into the Town and Distributing Stations.

purifiers and a station meter, all of which are designed for dealing with a maximum daily output of 5 million cubic feet of gas.

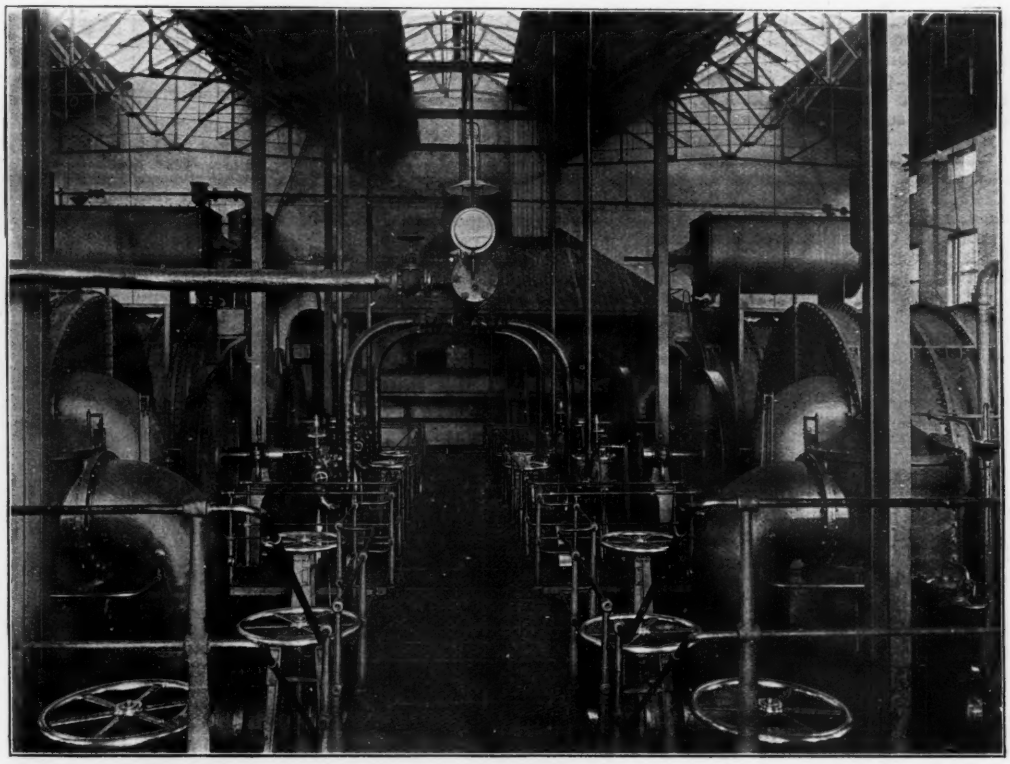
THE BUILDINGS AND PLANT.

Approaching the works by rail from the Princes Street Station of the Caledonian Railway Company, the train enters the Commissioners' private railway station on the eastern boundary of the works, where a passenger platform has been erected, together with a block of buildings comprising workmen's time offices, traffic offices, mess-rooms, &c., on the ground floor, above which, and covering the railway for a distance of about 100 feet, the upper storey forms the general stores for the works. The workmen, on landing from the train, must pass through turnstiles to record their transit for the information of the Railway Company. The whole of the traffic arriving at the works on either the North British or the Caledonian Railway system, or from the Granton Harbour, must pass in front of the offices and over the double weighbridges. All the traffic by rail in and out of the works is, therefore, under the observation of those responsible for its proper record.

Passing along the bridge across the line to the south end of the retort-house block of buildings, we first descend into the basement, where the engines for working the retort-house machinery and the coke-handling plant are placed. These engines are in duplicate, as the plant has to run night and day, and are of the Corliss type, each of 150 nominal horse power. In the same basement the hydraulic pumps for working the waggon tips and capstans, as well as part of the retort-house appliances, are seen—these also being in duplicate. Above this, and on the first floor, the exhausters, &c., are fixed; the 30-inch diameter communicating mains being suspended beneath the floor. The exhauster-house is fitted with a duplicate set of rotary exhausters, each set comprising two exhausters and one steam-engine; the arrangements being such that each steam-engine is capable of working all four exhausters by interposing a strap or straps in accordance with the circumstances of the moment.

Passing through the exhauster-house, we ascend a short staircase and proceed along a corridor, the floor of which is in reality the top of a double battery of water-tube condensers. On either side of this corridor, the workmen's comfort is provided for in the way of lavatories, bath-rooms, &c.—the latter being fitted with hot and cold shower baths, as well as plunge baths with fresh and salt water. Upon the other side, there is a spacious mess-room, with an ample amount of light and ventilation, fitted with steam-ovens and water-boilers. A feature of this room is the provision of small cupboards, forming a dado round, measuring about 17 in. by 16 in. and 6 feet high, for the men's clothes.

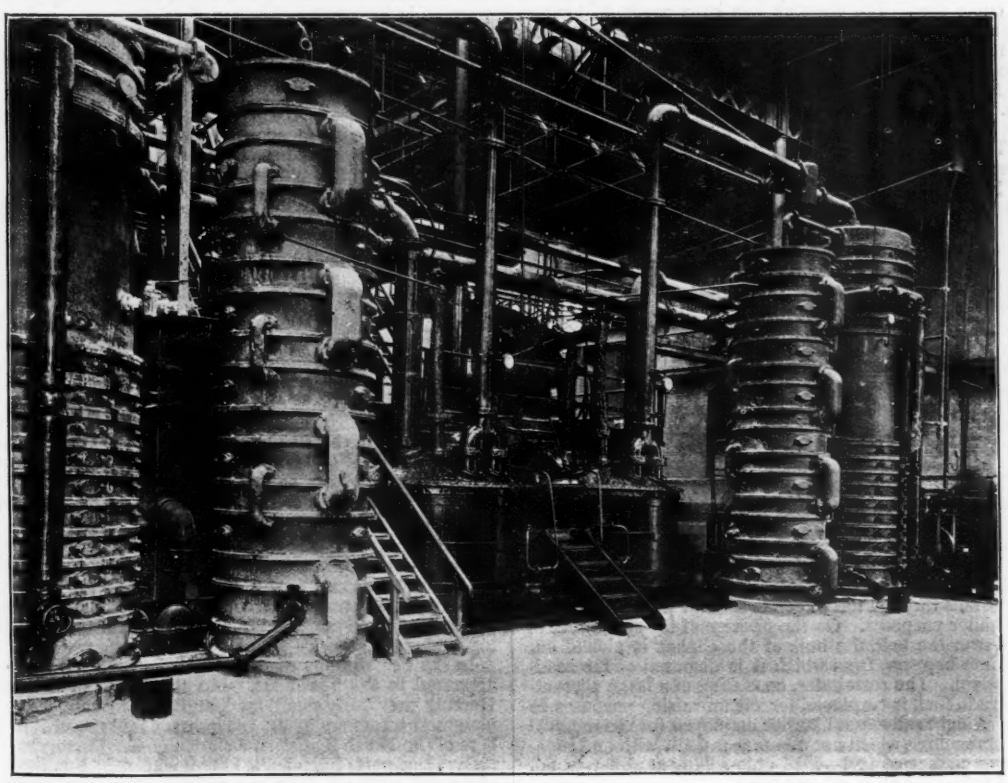
Traversing the corridor, and ascending a short flight of stairs, the charging-stage of the retort-house is reached. This house—probably the largest in the world—is fitted with a complete installation of inclined retorts, and is capable of carbonizing



Plant for Treating the Gas with Liquid Products for the Elimination of Impurities.

1000 tons of coal per day. It is equipped with every modern requisite in the way of labour-saving appliances; while the comfort of the operators has not been overlooked. Proceeding along the charging-stage to the centre of the building, we descend a broad staircase and arrive on the drawing-stage. The retorts are ⌂ shaped, 22½ in. by 15¼ in., and 20 feet long, set at an angle of 32°; and they are worked with four-hour charges.

The coal is conveyed into the retort-house from the centre of the building on the western side. It is delivered in railway waggons upon two lines of railways to a point near the transverse centre line of the retort-house, where a traversing 6-feet steel belt conveyor with hopper sides is sunk beneath the lines. In order to discharge these waggons, a system of hydraulic lifts has been adopted. Four of these are provided, so that four waggons can be discharged at the same time upon the traversing steel belt which feeds the coal-breakers. This portion of the apparatus is capable of handling 500 tons of coal per hour. The belt feeds the coal direct into the coal-crushers, where it is broken to a suitable size, and into one of a pair of elevators, each capable of raising 250 tons of coal per hour. By means of these elevators, the coal is lifted to a total height of 74 feet; the elevator head being in the dormer roof of the retort-house. Here the coal is



Ammonia Products Works, showing Ammonia Stills, Heaters, and Acid Saturators.

discharged into one of two transverse conveyors, which, in turn, can be made to feed four lines of conveyors running longitudinally with the building—one line being placed over each range of coal-bunkers. These are 168 ft. 6 in. long, and contain a maximum supply of 16 hours' storage, or about 700 tons. Beneath the coal-bunkers, measuring chambers are fixed for exactly gauging the quantity of coal (7 cwt.) required for one charge. Coke is conveyed along an inclined draining shoot, and at a height of about 31 ft. 6 in. from the ground is discharged over screens to separate the large from the small—the large being loaded direct into railway waggons ready for transport, and the small descending into hoppers beneath. In the whole of the manufacturing operations at Granton, the raw material is handled, and the residual products are disposed of, mechanically; physical exertion of the lightest character only being demanded from the operatives. The waggons discharging their coal alongside the retort-house are immediately moved forward to the coke-handling plant, where they are again loaded with coke for transport from the works.

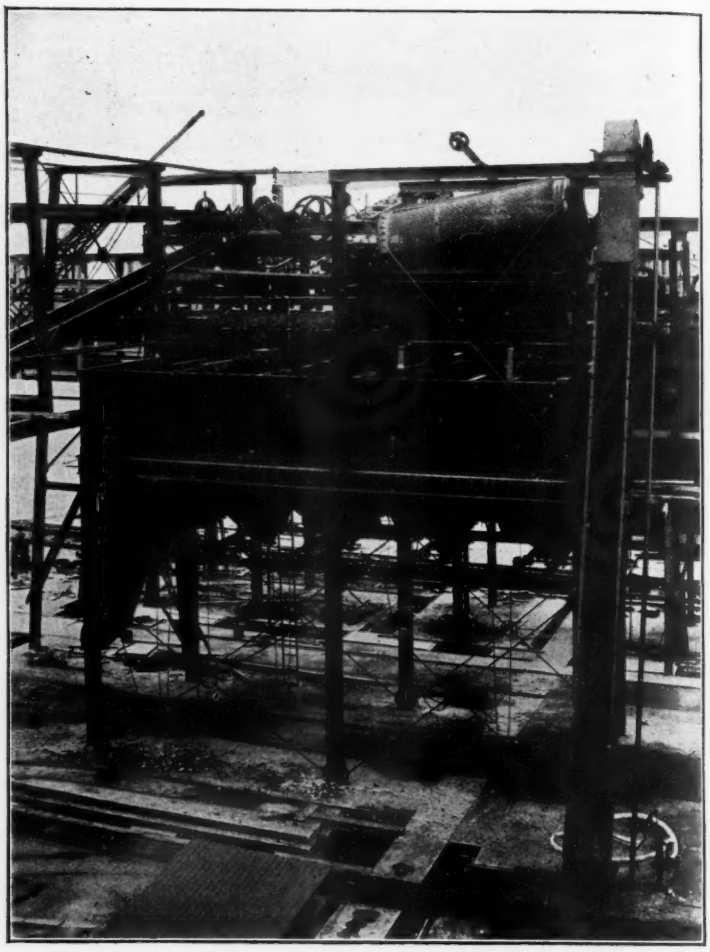
We now come to the portion of the plant dealing with the gas in its passage from the retorts to the holder. After leaving the exhausters, it goes first of all through the Pelouze and Audouin tar-extractors, then through the washer-scrubbers, and is afterwards dealt with by plant for the removal of the cyanogen compounds. It then goes forward to the oxide purifiers, which, and the material used, are manipulated mechanically.

The railway system throughout the works, extending to 6½ miles of single line, has been most carefully planned and elaborated. The traffic is marshalled upon a group of sidings in immediate connection with the approaches from the North British and Caledonian Railways, from which point the full waggons of coal are drawn and delivered to the retort-house in one direction, the empties continuing in the same direction ready for loading with coke and refuse. By such a system it is quite possible, with a train-load of coal arriving at the works at (say) seven o'clock in the morning, for the same waggons to be despatched with coke, &c., by one or two o'clock in the afternoon.

The gasholder—a conspicuous feature in the landscape—works in a masonry tank, 252 ft. 6 in. in diameter and 37 feet deep. It is constructed of brick, in cement mortar, encased in a puddle bed, and is thus rendered perfectly water-tight. The holder, which is telescopic, with four lifts, has a maximum capacity of 7 million cubic feet. The framing has been made to look as elegant as such a structure can be without an unnecessary expenditure to attain this end. The distance of the holder from the centre of supply necessitates pumping appliances being utilized to force the gas from Granton to Edinburgh, Leith, and Portobello. For this purpose, a very large type of gas-pumping machinery has been introduced, driven direct by powerful gas-engines. The appliances already existing are of such a capacity as to deliver 1½ million cubic feet of gas per hour. The present maximum hourly consumption throughout the district is equivalent to 1 million cubic feet per hour during the maximum lighting period. The gas is pumped and propelled through a 48-inch main to the central gasholder station at Canonmills, from which point it branches off in 24, 20, 18, and 15 inch mains to Leith and Edinburgh—the Edinburgh main continuing, *viâ* Duddingston, into Portobello.

The works are provided with blacksmiths' and mechanics' shops, equipped with forges, steam-hammers, punching and shearing machines, drilling-machines, lathes, screwing-machines, brass foundry, and joiners' shop, &c., &c., for repairing every class of plant on the works. This renders the Commissioners independent of outside aid for repairing and adjusting every type of machine employed on the works. Locomotive engines are running night and day manipulating the traffic on the works. There are also steam and hydraulic cranes. A narrow-gauge railway has been laid on the works for the transport of ashes from the retort-house furnaces to mechanical elevators, into the base of which the ashes are deposited; the elevator raising and automatically discharging the ashes into screening plant, the screen finally discharging its contents on to a picking-belt. The fine stuff that falls through the screen is sold for making concrete floors and similar purposes. On the passage of the remainder of the material over the belt, the bulk of the clinker is picked out and thrown into hoppers, from which it is disposed of for road-making purposes. The remainder, consisting of a large percentage of low-grade fuel, is employed for steam-raising purposes in the boilers. A light railway is likewise employed for the removal of the coke screenings, which are afterwards dealt with and separated into two classes of fuel—coke nuts selling at about 5s. 6d. per ton, and coke dust at 3s. 9d. per ton.

The products works are situated on a different portion of the site; the liquid products flowing by gravity from the upper works into tanks on the lower level, where the plant equipped for this purpose is installed, consisting of sulphate of ammonia, nitrate, muriate or chloride of ammonia, carbonate of ammonia, and liquid ammonia plants, as well as a sulphur-recovery plant.



Plant for Screening, Sorting, and Picking Furnace Refuse.

The technical staff are accommodated in a building which ultimately will form a meter-house for further extensions of the works. The staff, comprising chemists, draughtsmen, and statistical clerks, are accommodated on the first floor, where the technical part of the business is carried on. Beneath the building is the plant and apparatus for the testing of coal and other products, and where every description of appliance is provided for the manifold chemical investigations necessary for the scientific carrying on of the business.

The general offices on the Granton Road boundary have not yet been commenced, though preparations are in progress for starting operations early next spring.

From the outset it has been the Commissioners' endeavour to construct the works in such a manner that they may be as little nuisance as possible to the general public and the neighbourhood. The greatest care has been taken in the design and general disposition of the several parts to accomplish this, and to present a uniform and orderly aspect. As far as economical considerations would permit of this being done, the buildings have been rendered reasonably ornate, by carefully and tastefully arranging the material forming the component parts of the various structures, and spare plots on the works have been planted with trees and shrubs to assist in the carrying out of this object.

In conclusion, it may be interesting to note that the cost of the works in their entirety has been less than is usually allowed for such constructions; partly owing to their general design and planning, and partly to the fact that the Commissioners have carried out large portions—such as excavating, concreting, building, and similar work—without the aid of contractors.

In the descriptions of the Granton works which have already appeared in the "JOURNAL"—in the series of articles by Mr. Herring previously mentioned, and also in connection with the inaugural ceremony in February, 1903, and the visit of the members of the North British Association of Gas Managers last July—the various parts have been fully illustrated; but the views now given will, we think, form not uninteresting supplements to their predecessors.

STATEMENTS SHOWING THE MANUFACTURING COSTS AT THE GRANTON GAS-WORKS.

By W. R. Herring, M.Inst.C.E., Chief Engineer and Manager.

No. 1.—STATEMENT OF GAS MADE AND COAL CARBONIZED, ALSO COKE AND BREEZE PRODUCED, SOLD, AND USED.

—	Year ended May 15, 1904.	Year ended May 15, 1905.	Year ended May 15, 1906.
Coal carbonized	151,821·13 tons.	174,625·2 tons.	171,298 tons.
Gas made, corrected to standard temperature and pressure	1,584,758,000 cubic feet.	1,886,301,000 cubic feet.	1,881,205,000 cubic feet.
,, per ton of coal ,, ,,	10,438 ,,	10,802 ,,	10,982 ,,
Carburetted water gas made		83,346,000 ,,	96,642,000 ,,
Gas oil carbonized	Not erected.	1435·3 tons.	1865·5 tons.
,, equivalent in tons of coal		7715·15 ,,	8937·55 ,,
Total per ton of coal and oil equivalent		182,340·17 ,,	180,235·55 ,,
Total coal and carburetted water gas made		1,969,647,000 cubic feet.	1,977,847,000 cubic feet ; 10,973 cubic feet.
Gas accounted for	1,497,438,000 cubic feet.	1,861,194,000 ,,	1,861,550,000 ,,
,, per cent. on make	94·49	94·49	94·12
Illuminating power	24·45 candles.	24·21 candles.	24·14 candles.
Retort carbon produced	9 tons 13 cwt.	25·15 tons.	37·14 tons.
,, ,, ,, per ton of coal carbonized	0·142 lbs.	0·331 lbs.	0·493 lbs.

—	Tons. Cwt.	Per Ton of Coal Carbonized.	Per 100 Lbs. of Coal Carbonized.	Tons. Cwt.	Per Ton of Coal Carbonized.	Per 100 Lbs. of Coal Carbonized.	Tons. Cwt.	Per Ton of Coal Carbonized.	Per 100 Lbs. of Coal Carbonized.
								Cwt.	Lbs.
Coke and breeze produced on the various classes of coal actually used	89,347 4	11·77	58·84	110,615 11	12·66	63·34	108,936 18	12·72	63·59
Sold or available for sale	63,298 7	8·33	41·69	80,525 15	9·22	46·11	73,905 18	8·63	43·14
Coke used—									
For making carburetted water gas in generators	..	..	..	1,623 11	0·18	0·93	1,703 6	0·21	0·99
Steam raising for c. w. gas and all general purposes	5,624 18	0·74	4·26	8,533 4	1·07	5·35	10,351 5(*a*)	1·20	6·04
Travelling and derrick cranes	365 9	0·05		489 3			1,395 6(*b*)	0·17	0·81
Crusher and station buildings	99 2	0·01		94 0			117 10	0·01	0·07
Culvert and quarry pumps	389 11	0·05		228 8			152 8	0·01	0·09
Coke used in retort-house	19,569 17	2·59	12·89	19,121 10	2·19	10·95	21,311 5	2·49	12·45
(The above items by actual weight)	89,347 4	11·77	58·84	110,615 11	12·66	63·34	108,936 18	12·72	63·59

(*a*) Breeze only.

(*b*) Locos. added using coke instead of coal as formerly

Statistics relating to the Sulphate of Ammonia Plant.

—	Year ended May 15, 1904.		Year ended May 15, 1905.		Year ended May 15, 1906.	
Sulphate made	2018 tons.		2164$\frac{15}{20}$ tons.		2111$\frac{4}{20}$ tons.	
,, per ton of coal carbonized	26·3 lbs.		27·8 lbs.		27·6 lbs.	
	Amount.	Per Ton of Sulphate Made.	Amount.	Per Ton of Sulphate Made.	Amount.	Per Ton of Sulphate Made.
WAGES—	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.
Manufacture	341 0 11½	3 2·8	376 15 5	3 5·8	389 0 9	3 8·2
Loading and packing	192 5 4	1 9·9	187 3 5½	1 8 8	142 15 9½	1 4·2
Enginemen and boilermen	207 11 6½	1 11·6	201 7 10	1 10·3	209 6 11	1 11·8
Repairs to plant	710 5 3	6 8·9	382 2 3½	3 6·3	478 6 3½	4 6·4
General purposes, proportion chargeable under Nos. 27 and 28 in Statement No. 2	144 4 1	1 4·4	128 13 3	1 2·2	89 2 0½	0 10·1
	1595 7 2	15 1·6	1276 2 3	11 9·4	1308 11 9½	12 4·7

No. 2.—DETAILED ANALYSES OF THE GRANTON WORKS WAGES-BOOK, SETTING FORTH THE LABOUR COSTS INVOLVED IN PERFORMING THE OPERATIONS ENUMERATED, COMPRISING ALL ITEMS ASSOCIATED WITH THE MANUFACTURE, AND THE RUNNING OF THE WORKS AS A MANUFACTURING CONCERN.

——	Rates of Wages.	Year ended May 15, 1904.				Year ended May 15, 1905.				Year ended May 15, 1906.		
		Amount.	Per 1000 Cubic Feet.	Per Ton of Coal. 10,000 c. ft. Basis.	Per Ton of Coal. Actual Results.	Amount.	Per 1000 Cubic Feet.	Per Ton of Coal. 10,000 c. ft. Basis.	Per Ton of Coal. Actual Results.	Amount.	Per 1000 Cubic Feet.	Per Ton of Coal. 10,000 c. ft. Basis.
		£ s. d.	d.	d.	d.	£ s. d.	d.	d.	d.	£ s. d.	d.	d.
1.—CARBONIZING—												
1. Foremen (three senior and three junior retort-house foremen)	..	482 19 9	0·073	0·73	0·76	673 13 7	0·086	0·86	0·93	680 9 3½	0·086	0·86
2. Discharging waggons and coal breaking	4s. 4d. per shift	178 3 2	0·027	0·27	0·28	223 9 2½	0·028	0·28	0·31	202 17 1	0·026	0·26
3. Elevating and conveying coal	4s. 4d. ,,	310 15 2	0·047	0·47	0·49	410 14 8	0·052	0·52	0·56	435 6 11	0·056	0·56
4. Charging retorts	5s. 4d. ,,	1,760 15 8	0·265	2·65	2·78	1,865 4 11	0·237	2·37	2·56	1,830 0 10½	0·233	2·33
5. Drawing retorts	5s. 4d. ,,	3,414 11 10½	0·517	5·17	5·39	3,548 10 5½	0·453	4·53	4·89	3,478 17 0½	0·444	4·44
6. Pipe-jumping, cleaning, and pointing retorts, and greasing machinery, &c.	4s. 4d. ,,	1,066 14 10½	0·162	1·62	1·69	989 5 9	0·125	1·25	1·36	1,022 13 9	0·130	1·30
7. Producer and ashmen	5s. 4d. ,,	1,955 12 8	0·296	2·96	3·09	1,802 6 1	0·229	2·29	2·48	1,696 11 6	0·217	2·17
8. Hot-coke conveyor	4s. 4d. ,,	432 15 2	0·066	0·66	0·69	488 8 8	0·063	0·63	0·67	478 17 0	0·061	0·61
10. Enginemen for coal and coke-handling plant	4s. 4d. ,,	189 12 8	0·029	0·29	0·30	243 9 7½	0·030	0·30	0·33	243 0 6½	0·031	0·31
NOTE.—Actual duration of labour for chargers 3 h. 30 min., and for drawers 3 h. 54 min., per eight-hour shift. Time-and-one-third allowed for twelve hours on Sundays.	..	9,792 1 0	1·482	14·82	15·47	10,245 2 11½	1·303	13·03	14·09	10,068 14 0	1·284	12·84
2.—PURIFICATION—												
17. Lime spreading and slaking	6½d. per hour	364 3 8	0·055	0·55	0·58	283 14 6½	0·036	0·36	0·39	30 17 11½	0·004	0·04
18. Oxide, charging, discharging, spreading, and turning	6½d. per hour	1,118 8 0½	0·170	1·70	1·77	1,054 6 3½	0·134	1·34	1·45	844 2 9½	0·107	1·07
19. Elevating and conveying	6½d. per hour	101 16 5	0·015	0·15	0·16	96 7 3½	0·012	0·12	0·13	110 0 2	0·014	0·14
	..	1,584 8 1½	0·240	2·40	2·51	1,434 8 1½	0·182	1·82	1·97	985 0 11	0·125	1·25
3.—EXHAUSTER HOUSE, WASHER, PLANT, AND BOILER ATTENDANTS—												
11. 12. Exhausters, gas and oxygen, and scrubber-washers	4s. 4d. per shift	740 12 11	0·112	1·12	1·17	701 1 7½	0·089	0·89	0·97	665 10 1	0·085	0·85
21. Boilermen and trimmers	4s. 4d. ,,	781 12 1½	0·119	1·19	1·24	790 7 5	0·101	1·01	1·08	747 9 2	0·095	0·95
26. Syphonmen	5½d. per hour	113 10 10½	0·018	0·18	0·18	154 16 7½	0·020	0·20	0·21	151 14 7½	0·019	0·19
	..	1,635 15 11	0·249	2·49	2·59	1,646 5 8	0·210	2·10	2·26	1,564 13 10½	0·199	1·99
4.—OTHER ITEMS CHARGEABLE TO MANUFACTURE—												
9. Heating up retorts	6d. per hour	191 19 4½	0·029	0·29	0·30	168 9 1	0·022	0·22	0·23	154 3 8	0·020	0·20
20. Loco. men and shunters (half charged)	6s. to 5s. per day	515 16 11½	0·077	0·77	0·81	577 7 9	0·074	0·74	0·80	591 14 1½	0·075	0·75
22. Gasholder and pump-house men	3s. 9d. ,,	300 5 11½	0·045	0·45	0·47	338 13 5½	0·043	0·43	0·45	332 7 6	0·042	0·42
27. 28. General purposes, viz., office-staff, weighers, store-keepers, messengers, attendants, yard cleaners, &c. (proportion chargeable)	..	1,606 6 4	0·243	2·43	2·54	1,653 4 5	0·210	2·10	2·28	1,595 7 6	0·204	2·04
43. Filling ashes and emptying at refuse tip	5½d. per hour	373 0 4½	0·057	0·57	0·59	257 13 2	0·033	0·33	0·35	277 14 11	0·035	0·35
50. Culvert and quarry pumps	6d. ,,	171 2 3	0·026	0·26	0·27	64 8 1	0·008	0·08	0·09	106 6 10	0·014	0·14
	..	3,158 11 3	0·477	4·77	4·98	3,059 15 11½	0·390	3·90	4·20	3,057 14 6½	0·390	3·90
Grand Total of manufacturing costs on coal gas only		16,170 16 3½	2·448	24·48	25·55	16,385 12 8½	*2·085*	*20·85*	22·52	15,676 3 4	1·998	19·98
English Averages for 1903 (Groups 1, 3, and part of 4 only)							*3·03*					
Three London Companies for 1903 (Groups 1, 3, and part of 4 only)							*3·01*					
Granton, deducting Purification (Group 2) and General Purposes (items 27–28, Group 4)							*1·69*	Comparison on English basis.				

No. 3—DETAILED ANALYSES OF THE GRANTON WORKS WAGES-BOOK, SETTING FORTH THE LABOUR COSTS INVOLVED IN PERFORMING THE OPERATIONS ENUMERATED, NOT CHARGEABLE TO COAL GAS MANUFACTURE.

—	Rates of Wages.	Year ended May 15, 1904.				Year ended May 15, 1905.				Year ended May 15, 1906.		
		Amount.	Per 1000 Cubic Feet.	Per Ton of Coal. 10,000 c. ft. Basis.	Per Ton of Coal. Actual Results.	Amount.	Per 1000 Cubic Feet.	Per Ton of Coal. 10,000 c. ft. Basis.	Per Ton of Coal. Actual Results.	Amount.	Per 1000 Cubic Feet.	Per Ton of Coal. 10,000 c. ft. Basis.
CARBURETTED WATER GAS—		£ s. d.	d.	d.	d.	£ s. d.	d.	d.	d.	£ s. d.	d.	d.
Generator men	8d. per hour.	..	..	..	..	70 19 7½	0·204	2·04	2·22	75 2 2½	0·186	1·86
Coke and ash men	6½d. ,,	..	..	..	..	180 2 8½	0·518	5·11	5·60	99 15 8½	0·248	2·48
Engine and exhauster men	6½d. ,,	..	..	..	..	55 3 10½	0·159	1·59	1·71	87 1 7½	0·216	2·16
Clinkering, oil discharging, &c.	6½d. ,,	..	..	..	..	55 4 1	0·159	1·59	1·71	60 8 6	0·150	1·50
Purifying men	6½d. ,,	..	..	..	..	90 7 7	0·260	2·60	2·81	68 12 3	0.170	1·70
Boilermen	6½d. ,,	..	..	..	..	27 2 6	0·079	0·79	0·84	38 8 0	0·095	0·95
Syphonmen	5½d. ,,	..	..	..	..	21 13 9	0·063	0·63	0·68	7 15 10	0·020	0·20
General purposes, proportion chargeable under Nos. 27 and 28 in Statement No. 2	..	..	..	..	..	95 4 2	0·274	2·74	2·96	109 18 7	0·273	2·73
	..	..	..	..	..	595 18 3½	1·716	17·16	18·53	547 2 8½	1·358	13·58
REPAIRS AND MAINTENANCE—	Wages per hour.											
30. Mechanics at repairs whilst plant is running	Bricklayers, 9½d.–10½d.	908 11 10	0·138	1·38	1·44	910 16 9	0·111	1·11	1·20	761 0 6½	0·092	0·92
41. Mechanics and labourers at sundry repairs on works in general	Masons, 9d.	1,895 0 6½	0·286	2·86	3·00	1,742 9 8½	0·213	2·13	2·29	1,950 13 11½	0·236	2·36
39. Permanent way, railways and sidings	Joiners, 9d.	202 8 10	0·031	0·31	0·32	189 19 8½	0·023	2·23	0·25	258 15 2	0·031	0·31
32. Retorts and producers and fire-brick work	Painters, 8½d.	1,728 19 7½	0·262	2·62	2·73	2,694 17 3	0·328	3·28	3·55	3,208 11 3½	0 389	3·89
31. 33. Ironwork	Plasterers, 9d.	1,627 17 7	0·247	2·47	2·58	973 7 10½	0·118	1·18	1·28	1,076 11 8	0·130	1·30
34. Hot-coke conveyor	Plumbers, 9d., 9½d.	668 15 5	0·102	1·02	1·06	764 12 7	0·094	0·94	1·02	741 18 7	0·091	0·91
35. Carbonizing machinery	Slaters, 8d.	747 19 5½	0·114	1·14	1·18	666 11 1½	0·081	0·81	0·88	540 3 1	0·066	0·66
36. Purifying machinery	Fitters, 7½d., 8d.	83 15 9½	0·012	0·12	0·13	256 13 11	0·031	0·31	0·33	314 17 9½	0·038	0·38
37. Engines and exhausters	Blacksmiths, 7½d., 8d.	525 8 6½	0·079	0·79	0·83	606 16 11½	0·073	0·73	0·79	570 3 0½	0·069	0·69
38. Tools and implements	Gasfitters, 7½d.	450 5 6½	0·068	0·68	0·71	542 12 8½	0·066	0·66	0·71	621 5 0	0·076	0·76
40. Boilers	Labourers, 5½d., 6d.	442 12 8	0·067	0·67	0·70	395 11 6½	0·049	0·49	0·52	631 17 8	0.077	0·77
29. Carburetted water-gas repairs		..	..	..	..	44 18 6	0·005	0·05	0·06	115 8 9½	0·014	0·14
NOTE.—All of these items are sectionally subdivided in works books for both labour and materials.	..	9,281 15 4	1·406	14·06	14·68	9,789 8 7½	1·192	11·92	12·88	10,791 6 7	1·309	13·09
General purposes, proportion chargeable as above	..	1,107 2 7	0·167	1·67	1·74	1,098 15 6	0·134	1·34	1·45	1,224 16 6	0·149	1·49
Total repairs and maintenance	. . . . .	10,388 17 11	1·573	15·73	16·42	10,888 4 1½	1·326	13·26	14·33	12,016 3 1	1·458	14·58
OTHER ITEMS RELATING TO COKE, &c.—												
Loco. men and shunters (half charged)	6s. to 5s. per day.	515 17 0	0·078	0·78	0·82	577 7 9	0·074	0·74	0·75	591 14 1	0·071	0·71
Coke sales, screening and handling	5½d. per hour.	1,882 4 3	0·285	2·85	2·97	2,312 9 3½	0·280	2·80	3·05	2,459 13 1½	0·298	2·98
Coal storing	5½d. ,,	222 13 1½	0·033	0·33	0·35	95 15 1	0·012	0·12	0·13	32 11 2	0·004	0 04
General purposes, proportion chargeable as above	..	359 18 0	0·055	0·55	0·57	422 18 11½	0·051	0·51	0·56	489 3 9	0·059	0·59
54. Holidays* and allowances†	..	643 0 5½	0·099	0·99	1·02	1,124 9 2	0·135	1·35	1·48	1,230 18 6	0·150	1·50
	..	3,623 12 10	0·550	5·50	5·73	4,533 0 3	0·552	5 52	5·97	4,804 0 7½	0·582	5·82
RESIDUAL PRODUCTS—												
51. Briquette plant	6½d.–5½d. per hour.	159 19 1½	0·024	0·24	0·25	0 18 3½	..	..	..	..	..	..
44. 45. Cyanide plant	6½d. per hour.	306 9 5½	0·048	0·48	0·48	246 4 8	0·030	0·30	0·33	29 10 1½	0·003	0·03
46. Sulphate manufacture	5s. per day‡											
47. Loading and packing	5½d. per hour											
48. Engine and boiler men	5s. per day	1,451 3 1	0·219	2·19	2·29	1,147 9 0	0·140	1·40	1·51	1,219 9 9	0·149	1·49
49. Repairs to plant and appliances	7½d. per hour											
General purposes, proportion chargeable as above	..	211 9 1	0·031	0·31	0·34	156 8 9	0·019	0·19	0·20	89 2 0½	0·010	0·10
		2,129 0 9	0·322	3·22	3·36	1,551 0 8½	0·189	1·89	2·04	1,338 2 6	0·162	1·62

* To all workmen who have been ten months in the service nine days per annum are allowed. † Half pay is allowed in case of accidents only. All mechanics and labourers, as well as those employed in the carbonizing department, are allowed time-and-one-third for Sundays. ‡ Bonus granted per ton of sulphate made in addition to wages.

GAS ACTS FOR 1906.

SECOND NOTICE.

WE continue to-day the review of the group of Acts representing the applications by Statutory Gas Companies in this year's session of Parliament for further powers.

By the Act of the Cardiff Gas Company, their limits of supply have been extended. The agreement to purchase for £5000 the property of the Taffs Well Gas and Water Company is confirmed; but it is specially provided that nothing in the Act is to confer on the Cardiff Company any powers whatsoever for the supply of water. Compulsory land purchase powers have been obtained. The existing ordinary capital of the Company is to be consolidated and converted into an equivalent amount of ordinary stock, to be called consolidated ordinary stock, bearing a uniform maximum dividend of 5 per cent. The division of the stock among the proprietors is to be at the rates mentioned in the summary of the provisions of the Bill on Jan. 9 last. The Company are authorized to raise £300,000 of additional 5 per cent. capital—being £100,000 less than they asked for. The borrowing powers are to be equal to one-third of the additional capital. Sanction is given to the offering of new issues of capital to the consumers of gas or employees before submitting them to auction or tender. The section of the Act of 1887 relating to the reserve fund is repealed; and the sum now prescribed for the purposes of section 31 of the Gas-Works Clauses Act, 1847, is £65,000—£10,000 less than named in the Bill. After the expiration of five years, the Directors may, if they think fit, form a renewal fund. A clause with a very decisive tone about it says that "the Company shall not, after the passing of this Act, demand or receive for the supply of gas consumed within the city of Cardiff a greater sum than a sum after the rate of 3s. per 1000 cubic feet of such gas." In the rural district of Llandaff and Dinas Powis, too, except the parish of Pentyrch, they are not to demand or receive any greater sum than 3s. 3d., and at no time is the price to be more than 3d. above the charge to ordinary consumers in Cardiff. Fourteen-candle gas is specified, tested by Harcourt's 10-candle pentane lamp, the Metropolitan No. 2 burner (Sugg's argand was originally mentioned), and a table photometer. To the clause conferring power to supply gas apparatus—that is to say, to sell, let on hire, or otherwise deal in, fix, repair, and remove, meters, engines, stoves, ranges, dynamos, motors, pipes, and other apparatus—is appended a restricting provision which reads:

Provided that in no case where such fittings are, or have heretofore been, let on hire on the prepayment system shall such remuneration or rents or charges exceed 1s. per 1000 cubic feet of gas supplied to, through, or for the use of such fittings, and provided further that no dynamos, motors, or other electrical appliances, apparatus, or fittings, shall be sold, let for hire, or otherwise dealt in, fixed, or repaired by the Company within the city of Cardiff, nor within the parish of Eglwysilam, if within three years from the passing of this Act the Urban District Council of Caerphilly have commenced to supply electricity in the part of that parish included in the Company's limits of supply.

The sub-section of the clause providing for fittings not being subject to distress, has had attached to it these words—

Nothing in the preceding sub-section of this section shall affect the amount of the assessment for rating of any premises upon which any such fittings are or shall be fixed.

The Directors are given power to determine the remuneration of the Secretary. [*Parliamentary Agents: Messrs. Sharpe, Parker, Pritchards, Barham, and Lawford.*]

By their Act, the limits of supply of the Cheltenham Gas Company have been extended. The illuminating power of the gas to be supplied is reduced to 14 candles, in the testing of which the Metropolitan argand burner No. 2 is to be used, with the Harcourt 10-candle pentane lamp, and photometer as prescribed by section 30 of the Act of 1872 [see "JOURNAL," June 26 last, p. 920]. The following accompanying section is new:—

Notwithstanding anything to the contrary contained in section 29 of the Gas-Works Clauses Act, 1871, and section 36 of the Act of 1896, the gas may be tested at any time between 9 o'clock in the forenoon and 11 o'clock in the afternoon, and for that purpose the Gas Examiners shall have free access at all times, within those hours, to the prescribed testing-place. No notice of intention to test the gas shall be required to be given to the Company; but (subject to such absence of notice as aforesaid) nothing in this section shall prejudice or affect the rights of the Company under section 31 of the Gas-Works Clauses Act, 1871.

Clauses appear in the Act that were not in the original draft Bill regarding pressure and the testing of governors on street-lamps. As there is some novelty in them, they are reproduced—

Pressure.—(1) From and after the passing of this Act, the prescribed pressure in the mains of the Company shall be not less than 10-10ths of an inch head of water at the junction therewith of the service-pipes supplying the respective consumers. (2) The test for the pressure of the gas supplied by the Company may be taken by the gas examiner, without previous notice to the Company, at the top of the lamp-posts of the public lamps as hereinafter provided, at the level of the burner of such lamps; and for the purpose of making such tests the gas examiner shall remove the governor or self-acting regulator (as the case may be), and burner of any public lamp used for street lighting. (3) For the purpose of testing the pressure of the gas supplied by the Company, the gas examiner shall connect a self-registering pressure-gauge to the lamp-cock by a flexible or other suitable pipe, which shall be gas-tight, and such pressure-gauge shall be, as nearly as practicable, at the same level as the lamp-cock. (4) One-tenth of an inch shall be deducted from the registered pressure to allow for the difference between the pressure of gas at the top of the lamp column and that at which it is supplied in the street main. (5) Forthwith, after making any such test, whether the same shall reveal any deficiency in the pressure of the gas or not, the gas examiner shall give notice of the making of such test to the Company, stating the time and the position of the lamp at which such test was made, and the result of such test.

Testing of Governors on Street Lamps.—(1) The Company shall, upon the request in writing of the gas examiner, remove the self-acting regulator and burner of any lamp belonging to the Company used for public lighting of the streets in the borough for the purpose of ascertaining the amount of gas passed per hour through such self-acting regulator and burner. (2) The gas examiner shall give to the Company reasonable notice in writing of the time at which he proposes to test such self-acting regulator and burner; and the Company may, if they think fit, be represented at such testing by some officer, but such officer shall not interfere in the testing. (3) If the quantity of gas passed per hour through such self-acting regulator and burner at an initial pressure of not less than 16-10ths and not more than 30-10ths of an inch shall be found to be in accordance with the quantity from time to time agreed to be supplied by the Company for lighting such lamp, the Corporation shall, on demand, pay to the Company the cost of and incidental to the removal and replacing of the said self-acting regulator and burner. But if such self-acting regulator and burner shall be found to be defective, the gas examiner shall forthwith, by notice in writing, report the defect to the Company; and the Company shall, at their own expense within twenty-four hours after the receipt of such notice, make good the defect therein referred to, or supply and fix another self-acting regulator and burner. (4) The Company shall not incur any penalty or forfeiture, or be liable to any claim for, or in respect of, the omission to light any street-lamp of which the self-acting regulator and burner shall have been removed for testing under the provisions of this section if the Company shall have complied with the obligations by this section imposed upon them.

Within twelve months after Jan. 1, 1907, the Company are to supply and fix free of charge to any consumers who so require, flat-flame burners suitable for the consumption of gas of the illuminating power prescribed by the Act, in place of any flat-flame burners used by the consumer at the date of making the request. Notice of this provision is to be given to every consumer with the demand notes sent out during the twelve months, and to every consumer by coin meter, by leaving written notice at his or her residence *once every three months* during the same period. Other new provisions are as to the Company preparing maps of their mains and pipes, and giving the Corporation access to the maps at reasonable hours; as to the rendering of accounts for public lighting quarterly instead of monthly, and allowing a discount of 5 per cent. upon payment of the account within 21 days; and as to the Company using the best known practicable means of preventing the discharge from their works into the sewers, or any communicating drains, of waste refuse or sewage which, either alone or in combination with the sewage, would prejudicially affect the sewers or the bacterial treatment, disposal by sale, or application to land of the sewage matter, or which would, from its temperature or otherwise, be injurious to the sewers, or from a sanitary point of view. The portions of clauses in the Company's old Acts affecting the purification of gas from sulphur compounds are repealed. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Derby Gas Act extends the Company's limits of supply; and the agreement with the Spondon, Ockbrook, and Borrowash Gas Company, Limited, and with the Mickleover and Etwall Gaslight and Coke Company, Limited, of the one part, Messrs. J. Ferguson Bell and David Sibbald of the second part, and the Derby Company of the third part, for the sale and purchase of the Limited Companies' property, is confirmed. The terms were published on Jan. 9 last (p. 89). Powers are given regarding the construction, maintenance, and use of gas-works upon the land occupied by the Limited Companies. Provision is made regarding the testing of the gas. The Metropolitan argand burner No. 2 is authorized, used according to the Notification of the Metropolitan Gas Referees; and the Company are to be exempt from penalty in respect of any deficiency in the illuminating power of the gas supplied by them, unless the average of three consecutive tests made in any one day at intervals of not less than one hour shall be less than the prescribed illuminating power. The Company and the Corporation may from time to time agree upon any regulation with reference to the testing of the gas, in addition to, or in substitution for, any provision contained in the Metropolitan Gas Referees' Notification, subject to the approval of the Board of Trade. The Company are not to be longer subject to penalty by reason of the presence in the gas of sulphur impurities other than sulphuretted hydrogen. Section 39 of the Company's Act of 1852 is amended. This is the one regulating the price of gas supplied for public lighting; and now it will read and have effect as though the words "for lighting purposes" were inserted after the word "consumer" in the section. Annexed to the amending words is this provision: The price to be charged by the Company for gas supplied to the Corporation for any lighting purposes shall not exceed the lowest price for the time being charged to any person for lighting purposes, or 2s. per 1000 cubic feet, whichever shall be the lower. The Directors are authorized to determine the remuneration of the Secretary. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Bill that was introduced under the old cumbrous title of the Sutton, Southcoates, and Drypool Gas Bill now appears as the

East Hull Gas Act; and the Company previously bearing the long name will in future be known by the easily manageable appellation of the East Hull Gas Company. The conversion and consolidation of the capital on a 5 per cent. footing is authorized; and additional capital to the amount of £65,000 has been allowed. Inclusive of £5000 already borrowed, the Company are to be permitted to borrow £33,333, in respect of the consolidated capital, and up to one-third on the additional capital. A renewal fund is authorized; and the Directors are empowered to pay an interim dividend without the direction of a general meeting of the proprietors. Up to 5 acres, the Company may purchase lands by agreement. Prepayment meter clauses on the ordinary lines have been inserted. The proposed amendment of the public lighting clause was rejected during the course of the Bill through Parliament; but in the Act there now appears—this is the second Act in which it was inserted—the suspensory clause which was so frequently referred to during the recent session. [*Parliamentary Agents: Messrs. Martin and Leslie.*]

By their Act, the Epsom and Ewell Gas Company obtain extended powers, several of them of the usual nature. Quite early in the Act appear clauses protecting the District Council. Among them it is noticed that the Company are, to the reasonable satisfaction and approval of the Surveyor of the Council, to construct and maintain tanks in which all liquor resulting from the manufacture of gas or other product is to be collected and treated so that it shall be rendered harmless to the material of which the sewers and sewage collecting tanks of the Council are constructed, to the land on the sewage farm, and to the bacteria beds and works thereon. Power is given to purchase up to 10 acres of land by agreement. On the 1st of January next, the existing original and additional capital is to be consolidated and converted into one class of stock, bearing a uniform dividend at the rate of 5 per cent. per annum, subject to the sliding-scale provisions. The £30,000 of original capital is to be converted into £48,000 of consolidated ordinary stock, and £30,000 additional capital into £42,000 of consolidated ordinary stock. A scheme for division among the existing holders appears. Additional capital may be raised to the extent of £70,000, with one-third borrowing powers. Insurance and reserve funds are authorized. The standard price has diminished 6d. since the Bill was introduced, and is now 4s. Dividends will vary by 1s. 3d. in respect of penny reductions or increases in price in respect of any half year. The Company asked in the Bill for 13 candles illuminating power; and one of the concessions to local wisdom was 14-candle power gas. For testing the gas the Metropolitan No. 2 argand burner is to be used, with the Harcourt 10-candle pentane lamp; and the photometer may be either a bar or table. There is also the much-debated clause providing for the cession of the powers of supply of the Redhill Gas Company in the parish of Walton-on-the-Hill, if they do not extend their mains there within eighteen months, whereupon the Epsom Company may exercise the rights of supply. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Gas Companies' (Removal of Sulphur Restrictions) Act was noticed in the "JOURNAL" for Sept. 4, p. 647. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

In the Kidderminster Gas Act, the Company are empowered to manufacture on additional lands described in a schedule; and they have also authority to purchase further land by agreement up to 12 acres. The important part of the Act refers to the capital changes. The existing ordinary capital, consisting of £32,340, is to be converted and consolidated into £52,040 of 5 per cent. ordinary stock. Power is given to raise additional capital to the amount of £51,000, with one-third borrowing powers. New issues may be offered to consumers and employees before being submitted to auction or tender. A large number of provisions of minor importance are included in the Act—all useful, but not of general importance, seeing that they refer chiefly to management. Provision is made for renewal and insurance funds. The section of the Company's Act of 1867 referring to the maximum price of gas has been repealed; and the price has been limited to 3s. 9d. per 1000 cubic feet. Since the Bill was introduced, the testing clauses for the gas (14-candle power) have been revised; and it is now decreed that "the burner and other apparatus to be used in testing the gas, and the method and rules to be observed in the testing," are to be those prescribed under the London Gas Act of 1905. The progress of the Bill has also witnessed the tightening in of the powers of excess charge in the case of prepayment supply. The now ordinary authorization, as to an excess of 10d., 1s. including cooker, and 6d., was specified in the Bill. Now the clause says: "The maximum sum to be so charged shall be at the rate of 10d. per 1000 cubic feet, such sum to include hire of meter and the fittings used therewith, including cooker." The discounts clause—providing for 10 and 15 per cent. for prompt payment and large consumption respectively—has disappeared from the Act. [*Parliamentary Agents: Messrs. North and Talbot.*]

In the Merthyr Tydfil Act, the Company are given power to take additional lands for gas manufacturing purposes, as well as up to 5 acres by agreement. Clauses appear empowering the Company in connection with their works to use a viaduct and siding belonging to the Taff Vale Railway Company, and to construct sidings for the handling of their coal and coke and other products and material. A provision has been inserted in favour of the Glamorgan County Council (and later of the Corporation) as to the repair of roads. But neither the Glamorgan County Council nor the Corporation have their position altered "in respect of any damage consequent upon the use of a steam-roller for the purpose of such reinstatement;" and the Company are not relieved "from laying their mains and pipes at a reasonable depth, and in such manner as to prevent damage." The conversion and consolidation of the capital on a 5 per cent. basis is sought; the figures remaining the same as noticed on Jan. 9 last (p. 90). The extra capital has been reduced from the amount proposed, £60,000, to £45,000, with one-third borrowing power. Insurance, renewal, and reserve funds are provided for. The standard price of 3s. has given way by 3d. (now 2s. 9d.); and the operation of the sliding-scale will effect changes of 1s. 3d. per cent. in dividend in respect of 1d. alterations of price. The price to be charged for gas supplied for public lighting in the borough is to be at a rate not less than 3d. per 1000 cubic feet below the price charged for gas used by ordinary consumers for lighting purposes. The modern prepayment meter charge clause appears. For 14-candle gas, the use of the Metropolitan No. 2 burner is now prescribed, with a bar or the table photometer and Harcourt's 10 candle pentane lamp. This is the Act in which was set the precedent for a clause the side heading of which is "This Act not to prejudge or prejudice question of purchase if Corporation promote a Bill therefor." [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

By the Mirfield Gas Act, the Company are authorized to convert and consolidate their capital into a 5 per cent. stock; and additional capital powers are allowed to the extent of £90,000. Including £10,000 already borrowed, the Company may borrow up to £25,000 in respect of the consolidated capital, and up to one-third of the additional capital. Changes (which were not contemplated in the Bill) have been introduced into the sliding-scale. The standard price is now to be 3s. 9d.; and in respect of any year 2s. 6d. alterations of dividends may follow variations of 1d. in the price of gas. A renewal fund is authorized. The illuminating power of the gas is to be 15 candles, but nothing is said about its testing. Regarding discounts all that is specified is that "the Company shall not give any preferential price as between any consumers who shall take a supply from the Company for like purpose and under similar conditions and circumstances." The excess charge for prepayment supply is 1s. with meter and fittings and 10 per cent. on cost for meters only. The power gas clauses have been eliminated. [*Parliamentary Agents: Messrs. Robbins, Billing, and Co.*]

Fires and Illuminants.

It is certainly very hard on electricians that fires should often originate so near electric wires that someone jumps to the conclusion that the wires are not altogether irresponsible for the mischief, and thus put electricians to the trouble of denying that electricity is in fault. There is the Holborn fire, which (we read in an electrical contemporary) "seems to have originated at a wooden partition on the stairs, behind which passed an electric light cable." One of the witnesses suggested that this cable was in some way responsible for the outbreak. But Lieut. Sladen, third officer of the Fire Brigade, did not agree; and the jury returned a verdict that the cause of the fire was unknown. A fire also occurred recently on the premises of a Stockton-on-Tees tradesman; and it was attributed to "the fusion of electric wires." The Borough Electrical Engineer (Mr. J. J. Smith) has, we read, made an investigation into the matter; and after inspection has expressed his firm conviction that the fire was not caused by the electric light wires. "In the position," he says, "where the fire was first noticed, the wires were intact, excepting for such injury as they had sustained from the fire *external* to the wires. In the next place, there must have been some fused copper to be seen had the wires come in contact; and, in addition, the Corporation fuses would have been melted, but these fuses were in perfect order until removed by the Corporation foreman." A "firm conviction" is not proof positive; and after a fire in which electric wires are involved, it is a difficult matter to form even a "firm conviction." Another of our electrical contemporaries states: "The electric supply department in West Ham is very enterprising. We notice in a local paper a report of a fire by which a draper's shop was gutted. The cause of the outbreak was the throwing down of a match on a heap of shavings, *presumably* after the person had lit the gas. Immediately beneath the report is the municipal electricity department's advertisement, pointing out that fires of this kind would not occur in shops lit by electricity. The idea of putting the advertisement where it is was a smart one, and worthy of imitation by other electric supply authorities—always providing the local Press is willing to assist." "Presumably" matches are used in West Ham drapers' shops for other things besides lighting gas. Presumably, too, the writer of the paragraph has forgotten a recent disastrous fire at a South London drapery establishment.

The Lighting of Oxford Street.—The Marylebone Borough Council have received a communication from the Metropolitan Electric Supply Company questioning the right of the Council to lay mains and supply electricity for certain street lamps to be erected on the south side of Oxford Street. Counsel's opinion has been obtained on the point; and the Council are advised that they are fully within their rights in laying mains and supplying electricity for the lamps in question.

A SOLICITOR ON MUNICIPAL TRADING.

SOME hard things were said on the subject of municipal trading by Mr. Dixon Henry Davies, the Solicitor to the Great Central Railway Company, in a paper which he read a few days ago at the annual provincial meeting of the Law Society, which was held in Manchester. The contribution, which was entitled "Certain Unconstitutional Tendencies of Local Government," sought to show that in more than one direction our local authorities have fallen sadly behind the standard of sober administration which one has been accustomed to expect of British democratic bodies, and have brought about disastrous results to the community. Two instances were quoted to exemplify this tendency—the action of the local authorities with regard to electrical enterprise, and the general financial policy of such bodies. Taking the first of these two points, the views of Mr. Davies with regard to the backwardness of electrical development in this country appear to be somewhat similar to those expressed by Mr. Meyer in a recently published book on "Municipal Ownership in Great Britain," a brief notice of which appeared in the "JOURNAL" for Aug. 28 (p. 571)—that "after the British cities had paralyzed individual initiative and private adventure, they declined themselves to step in and fill the void created."

As to the second point—that of finance—Mr. Davies thinks it is a question whether local authorities have not in this respect managed to accomplish still more mischief. The rise in the expenditure of the local administration from £55,000,000 in 1889 (as compared with a net national expenditure of £74,000,000), to £121,000,000 in 1901-2 (or about £28,000,000 more than the normal national expenditure—excluding the increase subsequent to the South African war outlay), was drawn attention to in the paper; and also the fact that 25 years ago the debt of the local administration of Great Britain was under £100,000,000, whereas in 1903-4 it had risen to £469,231,417. As a reply to the attempt to justify the huge outlay on "reproductive" works by the plea that they would yield a profit for the relief of the rates, it was stated that in the last thirteen years the rates and taxes paid by the railway companies (not including income-tax and Government duty) had more than doubled. It was pointed out that the private trader suffered in two ways from the action of the local authorities in borrowing such big amounts of money, inasmuch as the corporations both diminished the supply of ready cash by absorbing it in permanent expenditure, and also competed with private businesses for what was left. The consequence to trade, argued Mr. Davies, must be disastrous. The chief sufferers by these contractions of enterprise were the working classes, inasmuch as, by making money dearer, the local authorities had made employment scarcer and labour cheaper. Vast losses had been inflicted on everybody who was dependent upon credit, including the Imperial Government.

In the author's view, the only seat of the disease is municipal trading; and he said "if that could be checked in the same bold and faithful manner that the reformers of the old Poor Law dealt with a somewhat similar economic disease, the evil would be stayed, and the local administration would return to the healthy and sound state which was its normal condition." The proposals which he made in his paper in order to achieve this were as follows: (1) The House of Commons should assume control of the local finances. (2) The local authorities should not be allowed a capital account as a rule, but should finance on revenue. (3) There should be an amendment of the Trustee Act, 1893, which provided that all securities of towns of over 50,000 inhabitants, and all county council stocks, were available for the investment of trust funds, unless forbidden by the trust investment. To this the following addition should be made: "Provided that the debt which any such stock represents does not exceed in the whole the assessable value for two years of the town or county in respect of which the stock is issued." (4) The scandal by which the municipal accounts escaped real audit should at once be stopped, as recommended by the report of the Municipal Trading Committee; and the auditors should be persons experienced in commercial accounts, whose duty it should be to sort the expenditure under the different heads, and exhibit a true and intelligible balance-sheet and profit and loss account of each department of the town finances, so as to put a stop to the "teeming and lading" devices now so commonly resorted to.

We have here merely given Mr. Davies's main contentions, and the conclusions at which he arrives. Naturally they do not altogether commend themselves to the out-and-out supporters of municipalization; but speakers in the subsequent discussion appeared to agree with a good deal of what had been advanced. Mr. J. H. Cooke, of Winsford, after arguing that Parliament controlled the expenditure of municipalities through the Local Government Board, admitted that at the present time they had to deal with a state of the law that was not altogether free from objection. He agreed that there should be a greater controlling power in the hands of those who had to pay the rates, and said that if the system that was in vogue in Japan were applied to Manchester, one-third of the members of the Municipality would be elected by the largest ratepayers, representing one-third the rateable value, and thus the representation of the rich, the middle classes, and the poor would be secured. If this be the condition of affairs in Japan, it seems that we may possibly have something to learn from them; for many large ratepayers will be inclined to agree with Mr. Cooke's view that under the prevailing system in this country of "one man one vote," men are elected to municipal councils who neither have the experience nor the stake in municipal affairs that is desirable. Another speaker—Mr. T. A. Needham, of Manchester—drew attention to the fact that municipal trading may sometimes prevent competition to which private undertakings would be subjected, by citing the case of motor omnibuses in that city; the Corporation, in issuing the requisite licences, having stipulated that the omnibuses should not be run along the municipal tramway route. Evidently, he said, the Corporation were afraid that the public might get greater benefits if motor omnibuses were allowed to enter into competition with the tramcars. Thus the Municipality, by virtue of their position as a trader and the controller of other traders, were using powers entrusted to them for the benefit of the community to advance the interests of their own private speculation. This is an aspect of the question that may well be kept in mind.

PERSONAL.

Welcome home! In the "JOURNAL" for the 14th of August, we announced the visit to South America of Mr. CHARLES HUNT, the President of the Institution of Gas Engineers, on a professional engagement. Mr. Hunt reached home again last Saturday; and his numerous friends in the industry will be pleased to learn that he has had an exceedingly pleasant and satisfactory trip. Mr. Hunt is enjoying good health; and that is the best of news after the severe illness in 1905 which delayed for a twelvemonth the journey that has now been so happily completed.

Alderman MASSEY, who has for 26 years been a member of the Hull City Council, has been presented by his colleagues with a handsome silver-gilt casket, a silver flower service, and a diamond pendant for Mrs. Massey. The casket contained a scroll, on which was inscribed a resolution passed by the Council upon the retirement of Alderman Massey from the chairmanship of the Parliamentary Committee. The Mayor, in making the presentation, pointed out that during Alderman Massey's chairmanship of the Water-Works Committee the undertaking was brought up to a very high standard of efficiency. He was also Chairman of the Special Committee having charge of the purchase of the Kingston Gas-Works. This step had been a great success; and had been a boon and a saving to those who consumed gas.

At the last meeting of the Belfast Gas Committee, the Chairman (Mr. J. A. Doran, J.P.) stated that Mr. JAMES STELFOX had intimated his intention to retire from the managership of the gas-works as soon as it would be convenient to the Committee for him to do so. The announcement was received with regret; and there were many expressions of approval of the able manner in which Mr. Stelfox had discharged his duties. Mr. Stelfox has been connected with the gas undertaking for nearly fifty years. His father became Manager of the works, which were then owned by a private Company, in 1852; and six years later Mr. James Stelfox began his official association with the establishment. In 1865 he was appointed General Assistant, which post he continued to occupy until his father's retirement in July, 1875. The Corporation had in the meantime, by arrangement with the Company, procured an Act for the purchase of the works; and possession was given on July 1, 1874. Mr. Stelfox, senior, agreed to remain in office for a year from that date; and when he retired his son became Engineer and Manager.

After a service of over twenty years, Mr. R. O. THOMPSON has retired from the Chief Engineership of the Metropolitan Gas Company of Melbourne, and has been appointed Consulting Engineer. Mr. P. C. HOLMES HUNT (eldest son of Mr. Charles Hunt), who was appointed Assistant-Engineer to the Metropolitan Company towards the end of 1902, has been raised to the position of Acting Engineer. The qualifying word is used, as the appointment is subject to confirmation later on; but among the friends of Mr. Hunt in the homeland, there will be no fear as to the full honour and responsibility eventually devolving upon him in title as well as—as they do at the present—in fact. It will be remembered that during the visit to, and long sojourn in, this and other countries that Mr. Thompson made in 1904, Mr. Hunt gave to the Board the greatest satisfaction by the manner in which he acted as the Engineer's *locum tenens*, and bore the full duties of the office. Preceding his appointment in 1902 as Assistant-Engineer, Mr. Hunt for about four years assisted his father at the Windsor Street Gas-Works at Birmingham; and in June, 1900, he was appointed by the Gas Committee to the management of the Adderley Street works. On leaving Birmingham for Australia, we congratulated Mr. Hunt, and offered him our best wishes for a successful career. So far it has shaped precisely as his friends could have desired; and as to the future, it is hoped that he may have health and strength to enable him to discharge the higher duties to the advantage of the great Company he serves, and to his own credit.

Mr. Humphrey's Lectures on "Large Gas-Engines."—The report of Mr. Humphrey's second lecture on "Large Gas-Engines," which was delivered at the Engineering and Machinery Exhibition last Thursday, is in type, but is unavoidably held over till next week owing to the pressure on our space.

ELECTRICITY IN GAS-WORKS.

By Chas. F. Botley, Assoc.M.Inst.C.E., of Hastings.

(*Concluded from p. 96.*)

As regards the size of the unit, to secure efficiency the working load should coincide with the full load, or nearly so; and as on a gas-works full control is possible, and with plant not all working simultaneously, a unit smaller than the aggregate motor connection may suffice. It must, however, be borne in mind that there are fluctuations in a power load, and that starting-up current has to be allowed for. Reliability in generation with steady voltage is important; for failure in the supply of current, besides being inconvenient and wasteful, may result in much damage. At Glyne, a 55 kilowatt set for each section of the works was decided upon. Taking the full load ampèrage at 110, the present total working load (at 475 volts) is 82; but the current for a De Brouwer charger has to be added, and there are coke-conveyors and other electrical driven plant contemplated. It will be seen that the unit is about right; and, as it is, the maximum (momentary) load reaches 100 ampères, and even more with careless starting-up of motors.

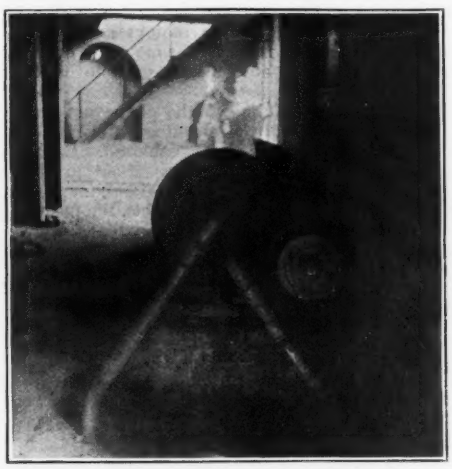


Fig. 4.—Electrically-Driven Coke-Dock Pump (2 inch) in the East End of No. 1 Retort-House.

Current is distributed by means of concentric paper insulated lead-covered cables; the standard size being 37-16, with a working capacity of 100 ampères. One such goes untapped from the power-house in the pipe culverts to the middle of No. 1 retort-house. Subsidiary circuits are laid to the pump room, to the purifying section (underground, in wood troughing and pitch), and overhead temporarily to the coke-breaker on the siding. Cables as described need for the lead covering to be electrically continuous; and such covering must be intact in damp places, otherwise the insulation between the concentric cables may break down. The circuit panels in connection are not yet installed. The motors by various makers mentioned in the following applications are generally for 460 volts; but all have been specified to withstand 500 volts. The descriptions are given in some detail to illustrate foregoing remarks.

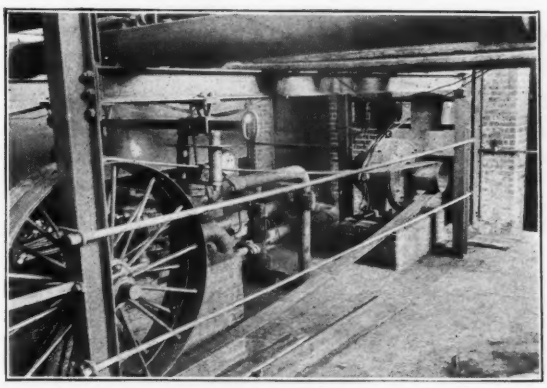


Fig. 3.—Hydraulic Pumps in the East End of the Coal-Stores.

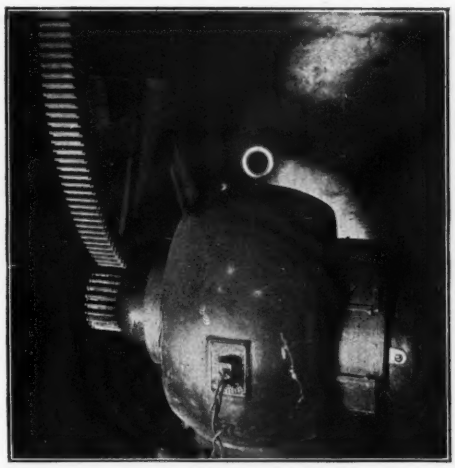


Fig. 5.—Motor in West Room, driving the Coal-Breaker.

For the first section of the Glyne Gap works, it was needful

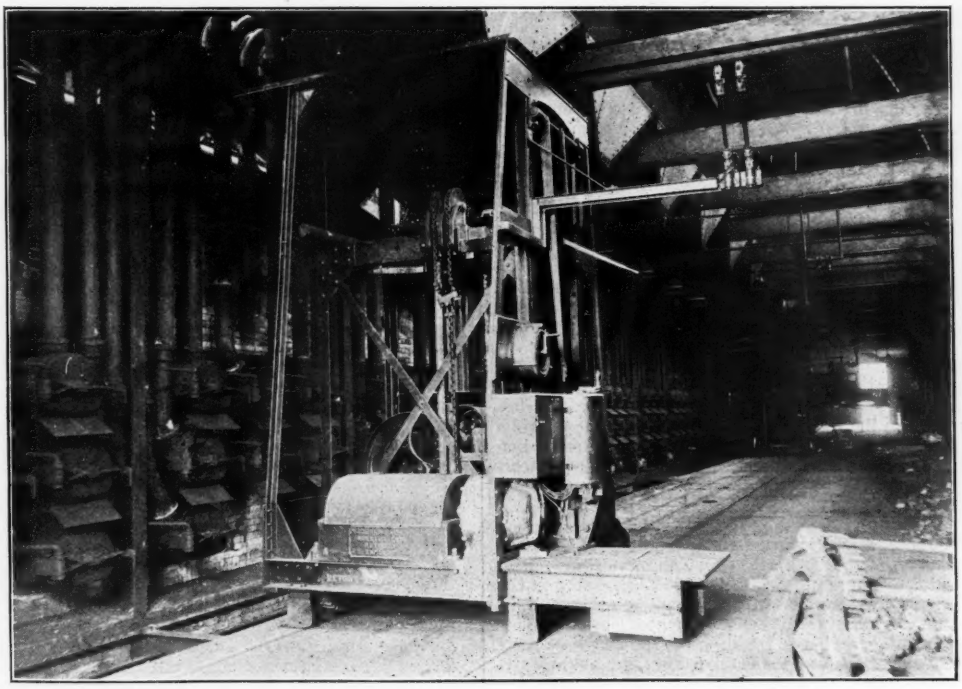


Fig. 6.—De Brouwer Charger under Erection at the South-West Corner of No. 1 Retort-House.

Fig. 7.—Belt Conveyor, transmitting Coal from Trucks on the Siding to Hoppers over the Breakers in the Coal-Stores.

to install only a portion of the hydraulic power system to serve the capstans, coke dock, truck lift, traverser, and tipping ram. There was a small space available at the end of traverser in the coal-stores for (temporary) pumps and accumulator close by the work. Power was necessary for the pumps, and the alternatives were gas or electricity. The work being intermittent and space limited, electricity was decided upon. As will be seen from Photo. No. 3, the pumps (delivering about 25 gallons of water per minute at 750 lbs. per square inch pressure) are belted to a compound wound semi-enclosed motor running at 900 revolutions per minute. The ironclad main switch, fuses, and starter are fixed above the motor, which has to work, under severe conditions, fully loaded with 34 ampères, and a totally enclosed machine

Fig. 8.—The Motor Driving the East Side Elevators and Conveyors in No. 1 Retort-House.

would be better. The motor is started up on a loose pulley, which is convenient. The supply of pressure (water) is controlled by a bye-pass opened by the rise of the accumulator, the operation of the bye-pass causing considerable current fluctuation. Another method is contemplated. The hydraulic system is being extended, and will pass the power house, where it will be fed by a steam pumping-engine; the above arrangement being retained as a stand-by, or else for use at light loads or when gas power only is available.

Outside the east end of No. 1 retort-house is the pit or dock in which trucks are lowered for loading with coke; and in this water accumulates in varying amounts and has to be removed. For this purpose a 2-inch rotary pump just inside the retort-house is used. It is geared to a semi-enclosed shunt motor running at 1350 revolutions, and is of 2 brake horse power (see Photo. No. 4). The wood case, with main and starting switches inside, can be seen on the wall above the motor. [As at 500 volts there are considerable risks from "arcing," &c., precautions, when using wood, have to be taken by lining with uralite or asbestos.] The working conditions here also are severe, and a totally enclosed motor would be much better. The alternative in this case would be manual labour.

In the retort-house, a De Brouwer charger was photographed (No. 6) during erection. This machine, which is a stand-by or alternative for the air-charging machinery, is another step in the direction of gas power throughout. It is equipped with a 7½ brake horse power totally reversible enclosed motor (see photo.) for travelling and hoisting, and a 4 brake horse power ventilated motor for charging. Besides the usual fittings, an ammeter is added for the operator's guidance. Current is taken from trolley wires carried on insulator brackets off the coal-hopper girders; the wires only being "alive" when the machine is at work. In designing the coal-stores, the central bay was reserved for the coal-handling plant; the original intention being to partition the space off. But further consideration showed the advisability of economizing space and bringing the coal stock as close to hand as possible. It may also be remembered that below the coal-stores are water storage tanks.

With these points in mind, the power question had to be decided. Steam being out of the question, the alternatives gas (direct) or electricity (gas indirectly) were gone into. The plant to be operated included two breakers, two elevators, two traverse, and four longtitudinal conveyers. Gas-engines would have had to be placed in the coal-stores, the floor of which it was not desirable to interfere with unduly, nor for any vibration to be set up; whereas the work could be subdivided among several motors, all of one size, and the power of the motors could be kept close to the work, as they will momentarily take overloads. The estimates of power required were not altogether accurate. The coal-breakers are geared to 13 brake horse power semi-enclosed compound-wound motors, running at 850 revolutions. The breakers have automatic feed gear and fly-wheels on the main shaft, which help. A flashlight photo (No. 5) is given of one of these motors taken in the brick room in which it is located. Despite this, however, the fine coal dust finds its way in everywhere, and has caused trouble; so that these motors are to be totally enclosed. Fortunately the motors are well up to the work. The starting switches are by the motors in each room, and the main switches outside on the wall, so as to be immediately accessible in case of need.

The elevator motors, which drive the conveyors also, were at the outset fixed at the top of the elevators, and geared thereto; being of 10 brake horse power totally enclosed. Each motor has to drive one elevator and cross conveyor, about 40 feet long, and one longitudinal conveyor, 100 feet long, simultaneously; and the power was under-estimated. Added to this, the position was exposed to extreme vibration, and the motors gave much trouble. The difficulty has now been overcome by installing 15 brake horse

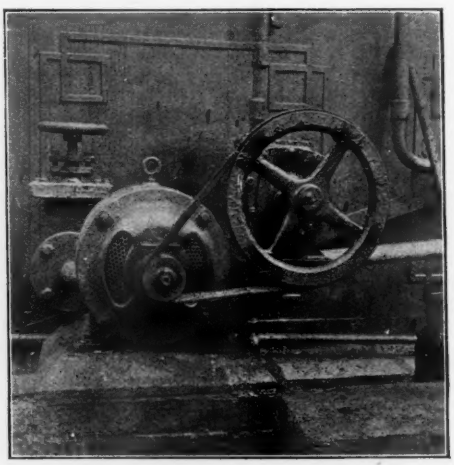


Fig. 9.—Syphon-Pump (1 inch) by Condenser.

power totally enclosed motors of superior design fixed on platforms off the coal-hopper girders, and driving by means of belting. (See Photo. No. 8). The starter is fixed on the wall at the rear of the motor; but the main switch is, with others, on the ground floor, so as to be readily accessible. The motors are not heavily loaded, except when putting the conveyors into gear, and are started up with the elevator, &c., empty.

The bulk of the coal (which is freighted in trucks of various types) has to be unloaded at the pit immediately outside the coal-stores, and thence to the hoppers over the breakers. At first a tram, propelled to and fro by hand, was used; but this soon gave

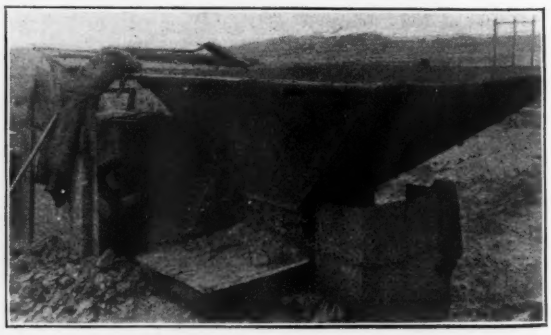


Fig. 10.—The Temporary Electrically-Driven Coke-Breaker on the High-Level Sidings.

place to (with advantage in all directions) a specially-designed belt conveyor. If Photo. No. 7 is examined, it will be seen that this apparatus is self-contained and mounted on wheels. It usually stands as photographed, but can be shifted in case it is necessary to work from stock for any long period. At the railway end, it is fitted with an automatic feed hopper actuated by the india-rubber belt itself; and at the opposite end, where the motor is, the coal can be directed into one or other, or both, of the hoppers over the breakers. The motor is of 6 brake horse power, totally enclosed, and is master of the work (if started up empty). It has been in use about a year without any attention beyond periodical cleaning and inspection. The enclosed starter is mounted on the frame; but the main switch is below on the coal stores wall; and flexible connections run to the motor, which drives by a link chain. The coal-handling plant (elevators and conveyors) will take 40 ampères (about 22 brake horse power) when at full working load.

The electrically driven Blake-Knowles pump (Photo. No. 11) is in the pump-room, which adjoins the boiler-house. It is a stand-by for the boiler-feed pumps (which the writer prefers steam driven), but is also connected up for various intermittent pumping. There is no speed regulation, and water can be put into the boilers very rapidly (1000 gallons per hour against 160 lbs. pressure), which sometimes is of advantage; and in case of a shut-down of the steam plant, water can be put on by it. The motor is rated at 3½ brake horse power protected type, and is geared direct to the pumps. The box with the main switch, fuses, starting switch, and pilot lamps, can be seen fixed above the pump in the photograph.

The motor syphon pump for tar or liquor in Photo. No. 9 did useful duty at the Hastings works for some time. When first supplied, the starter gave trouble, being too small; and subsequently at Glyne the insulation of the brush-holders failed. Considering the circumstances under which it has worked, this is not surprising; and it is a useful appliance where there is sufficient work to justify the outlay on it as compared with the inexpensive hand pump.

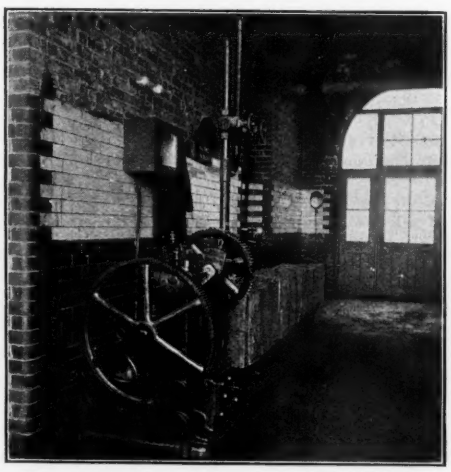


Fig. 11.—Electrically-Driven Blake-Knowles Pump.

The motor shown is ventilated enclosed (totally enclosed would be better), of ½ brake horse power for 250 volts, driving the 1 inch rotary pump by means of grooved pulleys and a special belt. At Glyne the motor was run with a lamp resistance (to reduce voltage) for some time; but as steam had to be used in the vicinity, and pumps were installed, the motor portion has been removed for the time being, and the pump is being driven by one of the other pumps.

Actual experience of the coke trade at the new works, together with the convenience of the coke-dock arrangement, has caused some modification of the original plans. Thus, while the breaking plant is being removed from Hastings, a temporary plant has been erected on the high level siding (see Photo. No. 10) in a position where the breeze and coke can be handled by road or rail. This consists of a West's coke-breaker, run at first by means of a small portable engine, but having subsequently on hand a 10 brake horse power totally enclosed motor with gearing, which was connected up and has proved satisfactory, taking only 4 ampères (just over 2 brake horse power). The photograph here reproduced was taken from the high-level side; and the motor, together with its starter, is in the box to the left, the main switch being in the power-house. The temporary fit-up will be obvious from the photograph.

As regards lighting at Glyne, little electricity is used, and in no place where light is constantly needed. The purifier section has been wired chiefly with pairs of 230 to 250 volts 32-candle power glow lamps across the outers or 460 to 500 volt lines; a safety fuse being used on each pair. Where the positive and negative lines cannot be kept well apart (at these voltages), it is wise to enclose all the wires, &c., in insulated metallic screwed tubing. For general lighting purposes about the works, lamps under 32-candle power are not of much service.

It will be understood that the applications of power referred to in this article have all been made with the choice of compressed air, steam, gas, or electricity available, and that the working conditions for electric motors are comparatively severe on a gas-works, although gas or steam motors meet the same readily. The striking characteristic of electrical power is convenience; reliability can only be assured by liberal expenditure, both in regard to capital and maintenance charges. It would be premature to discuss the commercial success or otherwise at Glyne; but any success will probably result from the general scheme rather than the individual merits of electric motors as compared with (say) gas-engines.

LOW-GRADE GAS.

By H. Leicester Greville, F.I.C., F.C.S., &c.*

The subject of the possibility of supplying cheaper gas has always been a question of the most intense interest to those concerned in the manufacture and supply of a commercial product which, without hesitation, may be positively and accurately described as an absolute necessity to our modern conditions of life and civilization. Consumers, although keenly alive to their own interests, do not appear to have exercised the same amount of intelligence in the question as could have been anticipated—mainly through ignorance of the best and most economical uses to which they can put the crude material which is conducted to their doorstep and delivered into their homes. This much, however, is certain—that they appreciate the solid aspect of finance meant by the reduction in the charge per 1000 cubic feet, with the eventual result on the gas bill.

The problem is at the present time to find some means, on the producer's side, of reducing the price of gas, with a maintenance of fair profit, without affording the consumer any grievance that he is not obtaining his *quid pro quo*. The most recent development of the question may be stated to have arisen from the publication of Mr. Shadbolt's patent for "Blending Producer Gas with Coal Gas," and subsequently commented upon by Mr. R. Bruce Anderson in his Presidential Address before the Irish Association of Gas Managers. I made some allusion to this address in an article published in your pages under the heading of "The Fringe of Photometry." A communication from Dr. Colman has since appeared in the columns of the "Journal," and later on a long letter from Mr. Anderson. The question of low-grade gas is of such importance as to deserve the most serious consideration. It is not to be solved by a series of letters or a series of articles, unless of a very extensive and comprehensive character; but any contribution towards the solution of a vexed and complicated problem may be of use.

Dr. Colman's article was mainly correct as far as his statistics; and there are only one or two minor details in which I may differ from him. But, "Circumstances alter cases"—an old and useful adage. In the first place, let us consider Dr. Colman's estimate as to the loss to the consumer possible on the introduction of producer gas into normal coal gas. Dr. Colman takes as his basis of calculation 1s. per 1000 cubic feet of coal gas into the holder, and 0·75d. for producer gas. The coal gas is based on a yield of 11,000 cubic feet per ton of a calorific value of 570 B.Th.U. (gross). The illuminating power is ignored; but, under present conditions, the officially recorded illuminating power is not probably worth serious consideration.

In the proportion of 11,000 cubic feet of coal gas of a value of 570 B.Th.U. and an addition of good producer gas of 120 B.Th.U. value, we should get an eventual result which would give a reduction of the cost of gas to 11d. per 1000 cubic feet, and at the rebate of 1d. per 1000 to the consumer would result in a reduction of 3 per cent. in price and 6 per cent. in calorific value in addition to disadvantages to the consumer—lowering of flame-temperature, &c.

This comparison, *ceteris paribus*, depends entirely on the estimate of the cost of raw coal gas; and this in its turn depends on the illuminating power and on how it is determined, cost of coal, &c. Dr. Colman's figures are fairly correct in placing the cost of normal coal gas into the holder at 1s. per 1000 cubic feet. It should be more nearly 13d. But there are circumstances under which the price of normal coal gas into the holder is higher. It might rise to as much as 1s. 6d. per 1000 cubic feet; and, as a matter of fact, it approximates to 1s. 5d. in many provincial gas companies. But there is no reason to assume that the cost of the so-called producer gas would increase *pro ratâ*. Taking Dr. Colman's own figures on the basis of cost into the holder in place of sale price, there is a reduction of 8·3 per cent.

In the general consideration of a broad question, it is not fair to accept the lowest statement. The large London Companies—with their exceptional advantages over huge contracts for coal and facilities over transit, delivery, and storage—contrast favourably, in regard to general economy, with the Provincial Gas Companies, who have no such advantages. Then (in many cases)

* This article was prepared for insertion in our last issue; but it had to be held over owing to the press of matter.—Ed. J. G. L.

comparatively small companies have their interests to consider, and their aggregate total output of gas is possibly considerably greater than that of the larger London concerns. Their case is therefore an element which should not be ignored in such a large question as that under discussion.

Before referring to other sides of the question, I should like to allude to a paper read before the Institution of Gas Engineers by Mr. H. E. Jones, in May, 1902, headed "The Illuminating Power of the Gas of the Future." An estimate is there given, on a basis of 11,500 cubic feet per ton of coal gas, of a B.Th.U. of 544 and a light of (old method) 13·3 candles, and of plain water gas costing into the holder 5·75d. per 1000 cubic feet, increased to 9·18d. per 1000 by enrichment by oil.

Without going into details, the eventual conclusion arrived at was that gas of 502 B.Th.U. could be supplied to the consumer at about 1s. 6d. per 1000 cubic feet. These figures are simply quoted to show that so many years ago, one of the leading thinkers in the gas industry anticipated the advantages which might accrue to consumer and the producer from the supply of a gas of a lower grade than that made by the usual stereotyped methods. It must, moreover, be remembered that the paper quoted was written with a due consideration of the maintenance of a statutory illuminating power, and that the cheap light now available from the use of low-priced incandescent burners was not then in evidence.

One of the main costs of gas production has always been the maintenance of the statutory illuminating power, as determined by what I cannot but now consider as an old method which should be effete. What is the value to the public of giving them an official return that their gas is of some 14-candle value, when they can obtain about ten times the light-value in their own homes by adopting a cheap burner and maintaining its efficiency at a merely nominal cost? Is it not time that calorific value replaced *quondam* photometry? I note that some advance has quite recently been made with regard to the Tottenham and Edmonton Gas Company, where calorific tests are imposed. What the definition is as to amount is not stated; but the broad fact remains of an innovation in (from my point of view) a right direction.

Let us now consider the question of the utility of manufacturing and supplying a cheaper gas than is at present in use from a different standpoint. One of Dr. Colman's arguments against the introduction of producer gas into coal gas was the lowering of flame-temperature by the admixture of inert nitrogen. Theoretically this is true; but Mr. Bruce Anderson, in his letter to the "JOURNAL," has already pointed out the fallacy of the argument. A diluent non-combustible gas undoubtedly lowers calorific power *pro ratâ*; but with regard to flame-temperature, the diluent gas simply adds in volume to the general products of combustion. It is on this volume and the respective specific heats of the constituents that flame-temperature depends.

On this basis, water gas with a B.Th.U. of (say) 305 gives a higher flame-temperature than good coal gas of considerably greater calorific value. Therefore, with regard to the emission of radiant heat and incandescence of mantles, water gas stands in advance. The question of flame-temperature entirely depends upon the composition of the gas, the B.Th.U. of the respective components and their proportions, and the volumes and specific heats of the combustion products. The question is one of purely scientific calculation, and the only possibility of error is our comparatively incomplete knowledge of the varying specific heats of gases at different temperatures. This, however, is not serious enough to affect the general question to any material extent.

The term "low-grade gas" does not mean anything absolute. At present it simply represents an expression of something which means some deterioration of the particular kind of gas which is produced and consumed under specified restrictions by Special Acts of Parliament.

With producer gas at something under 1d. per 1000 cubic feet and at B.Th.U. of about 120, and with water gas at about 5¾d. per 1000 cubic feet, with a B.Th.U. of about 305, we have the means of diluting ordinary coal gas with a value of about 550 B.Th.U. costing from (say) 1s. to 1s. 4d.

If a large proportion of nitrogen-laden producer gas were used as a diluent, the reduction of the calorific value of the mixture would be great, but the value of the flame-intensity not so large *pro ratâ*. If water gas were used as a diluent, there would be a drop of calorific power, but not of flame-temperature.

The question of radiant heat from stoves, &c., would not be interfered with, and the light available from incandescent burners would be maintained. On the other side of the question, the gas of lower calorific value would be of less efficiency for motive power and for purposes of cooking.

When serious fault is found with a suggestion to decrease the price of gas at a slight expense of its calorific value, it is curious to reflect that at the present time there must have been a considerable lowering of calorific value unnoticed and uncomplained of. I allude to three details: (1) The use of air as an aid to purification and the retention of CO_2 in the public gas supply. (2) The introduction of a new standard burner, which, by crediting gas with a higher illuminating value, enables a gas formerly rated as of a lower value to pass as of higher quality. If, for instance, gas of (old method) 12 candles can be passed as 14-candle, the respective B.Th.U.'s are 530 and 592. (3) The large use of carburetted water gas. I have few statistics of the actual thermal value of this gas, but it is presumably lower than absolute coal gas of just the same illuminating power. On the authority of Mr. A. G. Glasgow, carburetted water gas is credited with a B.Th.U. of 470 only.

The whole question is one which seems to me dependent upon the special conditions of the particular case; but, as far as I can judge, there is a strong argument in favour of the abrogation of the present valuation of gas by the present system of testing for illuminating power in favour of one founded on calorific value.

Memorial Tablet to South Metropolitan Reservists.

The current number of the "Co-Partnership Journal" of the South Metropolitan Gas Company contains a reproduction of a photograph of a tablet which has been placed in the entrance hall of the offices in the Old Kent Road to the memory of the reservists in the Company's service who died during the South African War. It is of embossed copper framed with inlaid oak designed and made upon the works. It was unveiled on the 12th ult. by Sir George Livesey, in the presence of a large number of representative employees from all the stations. Having read the inscription on the tablet, Sir George said it was the outcome of a desire that there should be some simple memorial of the self-sacrifice not only of those who gave their lives, but also of about 140 men who, as reservists, volunteers, or volunteer ambulance attendants, served their country in the Boer War. He then gave some particulars in regard to the formation and administration of the fund, amounting to £6250, raised by the Directors, officers, and workmen, and contributed to by the Company, to provide for the wives and families of the men on active service, and stated that, out of the £115 remaining in hand the cost of the tablet would be defrayed, and the balance reserved to apprentice or otherwise assist two or three orphans should they need help. As he unveiled the memorial, Sir George remarked that sacrifice, in one form or another, was necessary to the accomplishment of everything great or good; and the tablet would remain, when all then present had passed away, as "a record of sacrifices made at the call of duty and brotherly kindness by the men of all ranks in the service of the South Metropolitan Gas Company from 1889 to 1902."

Sir William Preece Tries to Explain.

The recent recommendation of Sir William Preece to the Carnarvon Harbour Trust, that they should adopt incandescent gas-burners for an outdoor purpose has produced no little consternation among electricians; and Sir William has evidently been pressed to make some sort of recantation in the interests of electricity. Mr. Tozer, a member of the Westminster City Council, has been the medium through which a letter on the subject from Sir William has been published. The letter our electrical friends have received with manifestations of great joy, though we cannot see that there is anything in it that is very comforting. Sir William writes: "It is extraordinary how the report of my supposed opinion has been circulated. The gas people are very clever. What I said was that I considered that the incandescent gas mantle was superior to the ordinary glow lamp for illuminating a quay down here. The question of Gas *v.* Electricity was not under consideration. It was simply a question of illuminating an open space for a particular purpose, and no other lamp but a Welsbach mantle and a small glow lamp were under consideration—not even the question of supply, for the Town Council has both. . . . If the question before them was Electricity *v.* Gas, of course I should plump for the former. I did not contradict the paragraph, for I learnt long ago that you cannot overtake a lie; it will have its course." There was not much supposition about the opinion, because Sir William now reiterates that he said he considered the incandescent gas mantle was superior to the ordinary glow lamp for lighting a quay at Carnarvon. If superior for lighting such an exposed position as a quay where a good light is required, it must be superior for any position. Where the "lie" comes in, it will be difficult for anyone to see. Perhaps Sir William will explain. Meanwhile as his memory as to the opinions he has held appears to be getting a little hazy, a quotation may be made from our "Electric Lighting Memoranda" for July 10 last, which will serve to remind him that the favour he showed the incandescent gas mantle at Carnarvon is merely the confirmation of an ancient and continuous belief. "In Sir William's British Association paper of 1896, on incandescent lamps, the best result he gave for electric lamps was far above the cost of gas lighting. Professor Ayrton pointed this out in the discussion; and Sir (then Mr.) William Preece's reply was, 'Gas per hour is unquestionably cheaper than electric light.' Then came the famous Maidstone report, in which Sir William advised the Corporation that incandescent gas lighting is better than electricity for the streets. Subsequent to this, when Sir William was Chairman of the Council of the Society of Arts—this was in the year 1901—in his address, he again said: 'The use of arc lamps for street illumination, in the United Kingdom, is not to be compared with the practice in the United States; but the difference is due to the universal presence of cheap gas here, and of no gas or dear gas there. As a matter of fact, gas used with the Auer mantle can compete satisfactorily with electricity in this direction.'"

COAL AND COKE HANDLING PLANTS.

By W. Angus, of Nechells, Birmingham.

[A **Paper read before the Midland Junior Gas Association, Oct. 6.**]

Coal and coke handling plants are now becoming almost an indispensable part of the equipment of a modern gas-works—that is to say, from about 200 millions per annum upwards. Consequently, it has become a necessity for the gas engineer and manager to acquire a thorough knowledge of the construction and working of these plants; and I am therefore of opinion that the illustrating of a few of the weak points which I have personally observed in the different appliances may be of some interest to the members of the Association.

The designing of coal and coke handling plants is a matter which has, with a very few exceptions, been left almost entirely in the hands of the contractors; and as it is usually a matter of competition in prices, economy in production is to a great extent the ruling factor of the designs. Competition is very useful in a way, and is undoubtedly the life of business; but I believe that in this matter it can be overdone, especially when more consideration is bestowed on the initial cost of the plant than on the actual design—a method which gives little or no encouragement to those makers who would try to improve the standard of the work generally, make provision for renewals and repairs, and also adjustment for the uptake of wear and tear, which would ultimately be greatly to the advantage of all concerned.

When selecting a plant of this description, I am of opinion that too much time cannot be spent in studying the detail drawings, as it is usually there that the whole secret of success or failure lies; and it is only those who have had experience of a troublesome coal or coke plant who can estimate the amount of worry and anxiety it can involve.

Coal-Crushers.

The function of a coal-crusher is to break the coal to a uniform size, generally of from 1½ to 2 inch cubes, leaving a minimum amount of dust. To do this, it has been found necessary for a crusher to be fitted with two sets of toothed rollers or discs, specially designed, and driven with differential gear at a speed suitable for the class of coal to be broken. The designs and dimensions of these toothed rollers or discs vary considerably, owing to the vast difference in the nature of the various coals; and as it has been found almost impossible to devise a crusher with rollers suitable for breaking all classes of coal to a uniform size, the designs of the rollers to some extent vary according to the districts.

The uniformity of the crushed coal plays but a small part in the charging of horizontal retorts with West or Foulis machines; and whether it affects the working of centrifical chargers or not I am unable to say. But with inclined retorts, it is a point which is very essential; and in many of the works where inclines are in use, it has been thought advisable for this reason to confine the supplies of coal to as near as possible one class, so that efficient carbonizing results may be obtained.

The casing of a coal-crusher is usually made of cast iron or steel, and fitted with gun-metal bushes for carrying the roller-shafts; but as there are numerous designs on the market, I think it advisable to confine myself to describing those given in figs. 1 and 2.

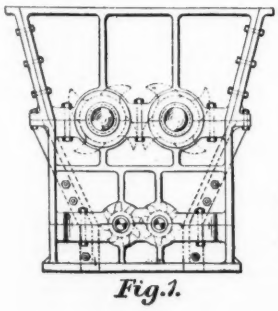


Fig. 1.

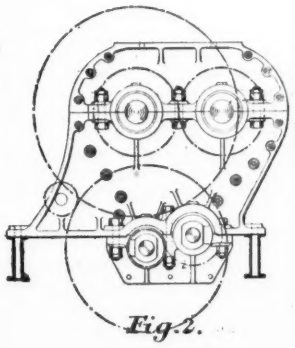


Fig. 2.

Fig. 1 is the side elevation of a coal-crusher commonly used in gas-works, though not perhaps of very recent design. The sides are made in three sections, which are bolted together on faced joints in line with the centre of the roller shafts; provision being made at this point to receive the gun-metal bearings, which are usually of a double flanged, solid, circular type. The top part of the casing of this crusher is spread outwards, so as to act as a small receiving hopper; and no pretence is made to protect the upcoming side of the crushing rollers from the weight of coal. Neither is there anything provided to prevent large pieces of coal from bye-passing the top rollers by means of the openings between the large teeth on the back side of each roller. In this design there is also the great disadvantage of having no provision for renewals or repairs; and before a bottom bearing or roller shaft can be withdrawn, the whole structure must be pulled to pieces, which is an expensive item when fixed under a heavy coal-hopper, as shown in fig. 3.

Fig. 2 is the side elevation of a coal-crusher of a more recent design, and by which the difficulties contended with in fig. 1 are greatly overcome—facilities being allowed for removing all the working parts most liable to wear without interfering with the structure. The bottom shafts, with rollers, gearing, and bearings (which as a rule constitute the parts most liable to wear and get out of order), can in this case be removed, repaired, and replaced with exceedingly little trouble when compared with that of the former design. The extra wear and tear on the bottom roller shafts and bearings of a crusher is accounted for by the fact that, while the top rollers usually run at about five revolutions per minute, the bottom ones run at about fifteen. It may also be noticed that on this crusher the casing is designed so as to protect the upcoming side of both sets of rollers from the weight of coal; and that owing to the back of the rollers being completely covered, it is almost impossible in this case for any large pieces of coal to escape.

The gear-wheels for driving a crusher are generally made of cast iron or steel, and are in most cases shrouded half up the teeth on both sides. Shrouded wheels for this purpose I have found to be rather a disadvantage, unless proper care be taken to keep the bottoms of the teeth clean. The grease used on the teeth is apt to collect coal dust, which, if allowed to accumulate, becomes caked hard into the bottom of the teeth; and I have known instances in which this has actually been the cause of bursting the side of a crusher casing. I am therefore of opinion that all crusher driving-wheels should be made of cast steel; and, if necessary for further strengthening, helical teeth should be adopted in place of shrouded sides.

Coal-Elevators.

Coal-elevators are used in a retort-house for the purpose (as the name implies) of raising the crushed coal from the outlet of the coal-crusher and delivering it into the overhead hoppers or conveyors. The outer casing of these elevators originally consisted of an open lattice frame-work, similar in design to that used in a push-plate conveyor; but within recent years the open framing has to a great extent been superseded by close plated

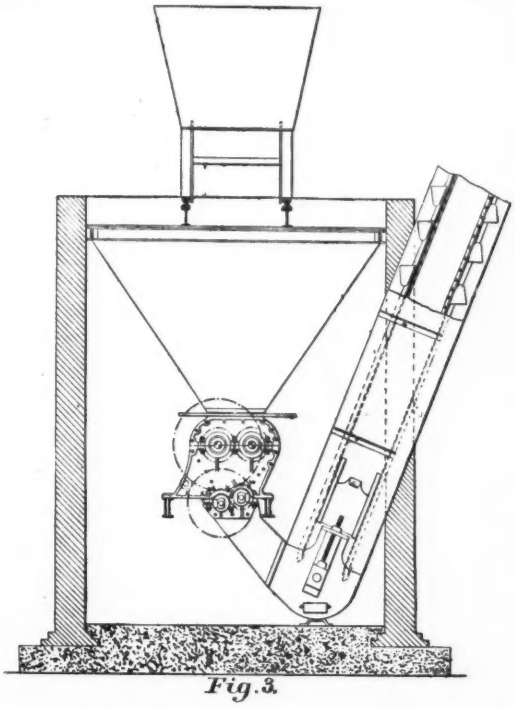


Fig. 3.

casings. This is an improvement in several respects, as it prevents the coal and coal dust from escaping, and also reduces the noise, and at the same time obviates the risk of anyone being hurt in the event of an elevator-chain breaking. The close plated casings are, of course, not so accessible for examination and repairs as the open ones; but if manholes are cut in either side of the casing at convenient heights, and fitted with doors, this trouble can be minimized considerably.

The inside or working part of an elevator consists of an endless carrying chain, which passes round the top and bottom wheels; and on this chain there are fixed, about 2 feet apart, the stamped or cast-steel buckets and skidder-bars, which are carried on the angle-iron guides of the casing. To protect the angle-iron guides of an elevator, it has been found advisable to adopt oak-strips, which, when properly fitted and well lubricated, reduce the wear and tear considerably.

The top driving wheel consists of an ordinary cast-steel

sprocket, suitably designed for the class of chain used; while the bottom wheel may be of the same pattern, but fitted with the teeth to travel in an opposite direction. The elevator boot, in which the bottom sprocket wheel works, is usually made with strong cast-iron sides and steel bottom plate, and is fitted with a pair of tension screws and adjustable bearings for tightening the chains.

The carrying chains of an elevator, which are usually made of stamped steel, cast steel, or malleable iron, are of the greatest importance, and too much care cannot be exercised in selecting a suitable design. The parts most liable to wear in a chain are the pins and pin-holes of the joints, owing to the constant motion in working on the top and bottom wheels; and the shocks and jars to which the chains are subject, necessitates an exceedingly large margin of safety, so as to ensure against occasional breakdowns. There is a great variety in the designs of chains; but in explaining the principles I will refer to those shown in figs. 4 and 5.

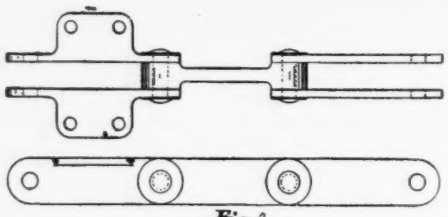


Fig. 4.

Fig. 4 is a chain in common use, and consists of a series of single and double links. The double links are made of mild steel strips about 2 inches wide by $\frac{3}{8}$ inch thick, and are riveted together by means of a steel pin on each side of a malleable-iron or mild-steel single link—angle links being inserted at suitable intervals for attaching the buckets. This chain is not detachable; and no provision is allowed for renewals and repairs. Consequently, when the pins or pin-holes begin to wear, the links get out of pitch, and the whole chain becomes absolutely useless.

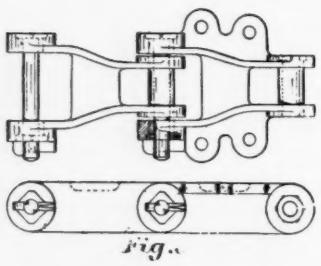


Fig. 5.

Fig. 6.

Fig. 5 is commonly known as the "Hack and Giles" chain, and is now largely used on both elevators and conveyors. It possesses many advantages over the former design. The links of this chain are detachable and interchangeable, and are fitted with renewable steel bushes and pins, so that when the chain becomes partly worn it can be taken off, repaired, and replaced without any great amount of trouble or expense.

The speed at which these elevators are generally driven varies from about 100 to 180 feet per minute; but when the angle of the casing is such as will allow of a good delivery, they should be run as slowly as possible. The angle at which these casings are generally set to comply with the above speeds is from 55° to 75°; but should the angle of inclination be increased beyond the figure last mentioned, some difficulty is experienced in getting the coal to leave the elevator, especially when the coal is damp.

It is occasionally necessary to employ a bent elevator, so as to clear either bench work or machines; but this practice should not be adopted unless absolutely necessary. The wear and tear on the guides and skidder-bars on this type of elevator is very excessive, owing to the chains being held in opposition to the direct line of tension (see fig. 6), which is from centre to centre of the wheels. To overcome this excessive wear, it is advisable to insert carrying pulleys under the upgoing chain, from the commencement of the bend upwards, which relieve the skidders of the weight and reduce the friction considerably; and I have even found it advisable with this type of elevator to adopt a solid rim or double flanged pulley in place of the ordinary sprocket wheel in the bottom boot, as, owing to the fixed radius and plain surface, the pulsation of the chain is somewhat minimized.

In many instances it has been thought advisable to run duplicate elevators side by side in one casing, and to place the coal-crushers sufficiently close, so that, by turning a flap plate in the chute leading from the crushers to the elevator boot, the crushers and elevators could be made interchangeable. This method works admirably so far as the casing is concerned; but at the points where the moving parts come in close contact—such as at the elevator top, elevator boot, and coal-crushers—it is anything but a satisfactory arrangement, owing to the fact that it is almost impossible for a workman to repair one plant while the other is in motion.

Coal-Conveyors.

Push-plate conveyors are generally preferred for the purpose of conveying the coal from the elevator top and delivering it into the overhead storage-hoppers in a retort-house. There are several designs of this class of conveyor, even for handling coal; but these principally differ in the section of the troughs and in the method of carrying the chains and push-plates. The one which I will detail is shown in fig. 7, and is of the type most commonly used.

Fig. 7.

Fig. 9.

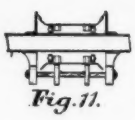


Fig. 11.

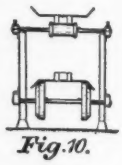


Fig. 10.

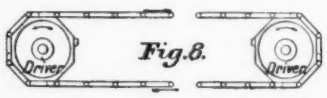


Fig. 8.

Fig. 12.

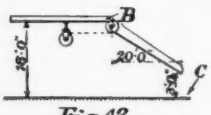


Fig. 13.

The framing consists of two channel-irons set at about 18 inches apart, and riveted together by means of a mild-steel bottom plate, forming a trough for carrying the coal, and in the bottom of which are fitted sliding doors for the purpose of depositing the coal where required. On the outside of the channel-irons are fixed the cast or angle-iron standards, which are braced together for the purpose of carrying the guide-angles supporting the return chain and push-plates. The chain and chain-wheels of a conveyor are usually of the same pattern as that used in an elevator; and it has been found advisable, both on elevators and conveyors, up to a capacity of about 40 tons per hour, to use one line of chain in preference to two, owing to the difficulty in getting both chains to keep exactly one length and take an equal share of the work. The push-plates and chains in this conveyor are supported between the wheels by means of a skidder-bar, which is attached to each push-plate; and these skidder-bars slide on the oak-strips which are fitted to protect the guides.

Many breakdowns on both elevator and conveyor chains have been caused through the sprocket wheel at the return end being placed with the teeth in the wrong direction; and to overcome this, it must be remembered that, while one wheel is the "driver," the other is the "driven," and must consequently be placed with the teeth to work directly opposite to each other, as illustrated in fig. 8.

Another type of push-plate conveyor is shown in fig. 9, in which rollers are inserted in place of skidder-bars; and when proper care is taken with lubrication, this system is all that could be desired.

Band conveyors are frequently used for the purpose of conveying coal from an elevator top to the overhead storage-hopper on the opposite side of a retort-bench; and for this purpose they work admirably. When placed, however, where there are several points of delivery, or where there is a continuous row of coal-hoppers holding from 6 to 8 tons each, the constant moving of the tipping-carriage becomes an objection. The canvas band or belt for carrying the coal, which is usually about 2 feet wide, travels on carrying-rollers at about 200 feet per minute; and when the band is protected from excessive heat, this conveyor runs very smoothly and gives exceedingly little trouble.

Coke-Conveyors.

Conveyors of almost every conceivable shape and style have been tried for the purpose of conveying coke; and to attempt to detail the various designs would, I am afraid, indeed be an endless undertaking. The principles upon which these conveyors have been based, however, may be classified under the headings of carrying conveyors and drag conveyors.

Carrying conveyors have chiefly consisted of the types known as steel-band conveyors, tray conveyors, and pan conveyors; and in districts where it is necessary to get the coke as large as possible, this class of conveyor seems most adaptable. The wear and tear on all descriptions of coke-handling plant is very excessive; but on this kind of conveyor, it is exceptionally so, owing to the great quantity of working parts, which are all more or less exposed to the effects of heat, water, and grit; and though many ingenious devices have been designed to overcome this trouble, and to ensure protection, we have not as yet been able to get what is really wanted.

The best results have been obtained from carrying conveyors when placed on the floor of a coke-cellar, at the back side of a

retort-bench, or in a coke-yard, where it could be arranged so that all the working parts could be seen and were "get-at-able."

One type of this class of conveyor worthy of attention is that known as the Hack and Piggott pan conveyor, shown in fig. 10. This consists of a series of cast-steel pan and link combined; and though heavy in design, it is exceedingly simple and easily repaired, and is one of the few coke-conveyors which have stood the test of time, and will to-day compare favourably with any on the market.

When carrying conveyors are erected, however, on the furnace side of a setting, with one strand above and the other below the floor-girders, or perhaps with both strands below the floor-girders, but placed close to the roof, so as to allow clearance for the firemen to work at the clinkering doors, and where it is usually impossible to see either the chains or the rollers, the wear and tear is very great; and owing to the rapid corrosion of the mild steel, and the inconvenience in handling the wearing parts in this position, the arrangement has invariably proved to be anything but satisfactory.

Drag conveyors originally consisted of the push-plate pattern, similar to that used for coal; but within recent years this design has, to a great extent, been superseded by what is now commonly known as the bar conveyor. With the first designs of the bar conveyor some considerable troubles were experienced by the cross-bars which were riveted through the solid links of the chain becoming loose, and by the false bottom plates, which were made of mild steel, wearing rapidly and buckling upwards with the heat, thus causing projections which obstructed the travelling and broke the coke considerably. Similar troubles were experienced by a sharp incline which was formed at the discharging end of the conveyor, with the view of keeping water in the trough, and also by the trough buckling with the expansion through being bolted to the floor-girders.

In some instances, these troubles have been overcome, however, by adopting a solid stamped bar and links combined, and by inserting chilled cast-iron false bottom plates and angles in place of mild steel, and also by abolishing the incline and allowing the trough freedom for expansion. Another great improvement which has been made on this class of conveyor is the carrying of the return chain on single flanged wheels, in place of the angle-iron guides, as this has reduced the friction and confined the wear to one side of the chain, and has also completely overcome the continual trouble experienced by the angle-iron guides and wearing strips.

This type of conveyor is exceedingly simple, and is very adaptable for working in front of a retort-bench; and when the trough is placed so that the coke can travel on a level plane, and substantially designed as shown in fig. 12, with sufficient freedom for expansion, the arrangement is very satisfactory.

The great objection held by many to this class of conveyor is the breaking of coke; but from experience I have found this to be caused more by the condition and general arrangement of the troughs and chutes than by the actual principle of the design.

The following tests were recently taken on this type of conveyor; the coke being collected at the points marked B and C in fig. 13:—

A.—*Coke Collected by Barrow on Discharging-Stage while leaving Retorts, Forked over with 12-tined Fork, and Breeze Riddled on ⅜-inch Riddle.*

	T.	C.	Q.		Per Cent.
Coke	15	17	0	=	87·7
Breeze	1	15	0	=	9·7
Dust	0	9	1	=	2·6
	18	1	1		100·0

B.—*Coke Collected at Discharging End of Longitudinal Conveyors after Travelling an Average Distance of 220 feet, Forked over with 12-tined Fork, and Breeze Riddled on ⅜-inch Riddle.*

	T.	C.	Q.		Per Cent.
Coke	11	5	0	=	85·9
Breeze	1	8	0	=	10·7
Dust	0	9	0	=	3·4
	13	2	0		100·0

C.—*Coke Collected at Bottom End of Temporary Chute leading from Longitudinal Conveyor, Forked over with 12-tined Fork, and Breeze Riddled on ⅜-inch Riddle.*

	T.	C.	Q.		Per Cent.
Coke	18	17	0	=	67·8
Breeze	6	17	0	=	24·6
Dust	2	2	0	=	7·6
	27	16	0		100·0

Showing 1·8 per cent. of the coke broken by conveyors, and 18·1 per cent. of breakage by the chute.

Coke-Elevators.

Continuous bucket elevators have in many instances been tried for the purpose of elevating coke; but owing to the excessive wear and tear and the large percentage of coke broken by the buckets, they have invariably proved anything but a success. For raising coke by means of a long incline, conveyors of the types already mentioned have been used, and have in most instances been found to work fairly satisfactorily; but for lifting coke in an almost vertical direction and distributing it either on a coke-screen or in a coke-yard, I am certainly in favour of a steam or hydraulic crane fitted with a suitable coke-skip.

Lubrication.

The efficiency of all machinery is raised considerably, its life prolonged, and the cost of repairs reduced to a minimum, by the use of carefully selected lubricants, when properly applied. It is very desirable to apply lubrication continually, without waste, to all working surfaces; and that I have found can be done most efficiently on this class of machinery by fitting a spring lubricator shown on fig. 14 or an ordinary Stauffer grease lubricator on each

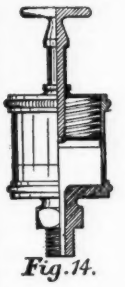


Fig. 14.

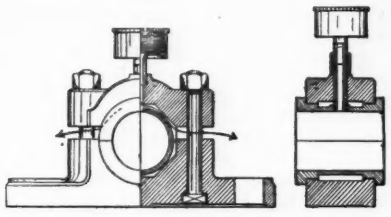


Fig. 15.

of the bearings—at the same time taking the precaution to see that a proper connection is formed, by means of a small piece of tube between the top half of the gun-metal bearings and the lubricator. This latter point is certainly worthy of consideration, as it is very often found, when the lubricator is only screwed into the cast-iron cover on top of the bearings that the lubricant never reaches the point in motion, but simply passes through the recess at the back of the gun-metal bearings and escapes from between the cover and the block, as illustrated in fig. 15.

Conclusion.

I trust that these few notes, though they have shown no new aspect to the industry, may lead to a discussion which will be to the advantage of the members of the Association, regarding the difficulties which are to be contended with in the construction and working of the different appliances employed for the purpose of handling coal and coke.

Discussion.

The Hon. Secretary (Mr. J. Hewett) remarked that they were all greatly indebted to the author for his very interesting paper. Mr. Angus had had a unique experience, not only in the working, but also in the manufacture, of conveyors; and so he was thoroughly competent to deal with the subject. Coming to the paper, the advice offered by Mr. Angus on the selection of a plant was good; but the general arrangement, specification, and a detail drawing of one or two standard parts usually submitted with tenders for such work were not sufficient for such a close comparison as was suggested by Mr. Angus, though perhaps all that should be expected when but one of the half-dozen or even more firms tendering could secure the order and recoup themselves for this initial expenditure. The case, however, he thought could be completely covered by inserting a clause in the general conditions accompanying the inquiry, to the effect that before any portion of the work was put in hand detail drawings should be submitted to, and approved by the engineer. With regard to coal-crushers, he thought Mr. Angus might have mentioned the material he preferred to use for the rollers. Of the two in common use—cast steel and chilled cast iron—he himself was in favour of steel. The first cost of steel was, of course, considerably greater; but it was not only the initial cost that had to be taken into account. The question of duration was also an important factor; and steel had a longer life. Looking at the designs shown in the paper, there was one peculiarity he had at once noticed; and that was that in fig. 2 the bottom rollers of the coal-crusher were placed on different levels, instead of on the same horizontal lines, as in the case of the other rollers illustrated. He thought that it was quite as necessary to arrange for the easy removal of the upper rollers as of the lower. Certainly, there was more wear on the latter; but shocks to which the former were more liable, owing to large lumps of coal approaching the rollers crosswise or to pieces of iron and steel hidden in the coal, might cause a fracture of the upper rollers at any moment, entailing their immediate renewal. The use of a belt in the drive of a crusher greatly reduced the effect of these shocks; and for simplicity and cost, fast-and-loose pulleys were superior to clutches, and were less likely to get out of order. With regard to the receiving hopper, it was important that the door should be in two halves actuated by gear, so that the orifice should always be central over the rollers. It was also advisable, as the door was often heavily loaded with coal, that it should be mounted on rollers, to render easier the operations of opening and closing. Coming to the renewable wearing strips for elevators and conveyors, these were not confined to oak, but were frequently made of other kinds of wood or steel. If wood was adopted, it should be straight-grained. It was difficult in the type of chain shown by fig. 4 to prevent the pins turning in the narrow outer links. This had been entirely overcome in the Hans Renold design of

this chain, in which the pins were subject to no wear whatever, unless the heads of the pins were used as guides for the chain. Mr. Angus did not tell them anything about the chutes from the elevator to the coal-conveyors. He (Mr. Hewett) thought it was very important that they should be arranged in such a manner that the coal was distributed across the full width of the conveyor to an equal depth. There was also another point in connection with the chute—it should be so arranged as to make it impossible for any coal to fall on the conveyor chain. The paper gave them a series of conveyors to consider; but they were not by any means the total number of designs. Everyone had its advantages and disadvantages. As to tray conveyors, the one shown with the fixed rollers had advantages, because it was very easy to lubricate it; but a disadvantage of the fixed rollers in tray conveyors was that the chain and trays travelled in a wavy line, due to the sag between the rollers, subjecting the pins and rebates of the tray to a continual wear, instead of only during the period taken in passing over the end sprocket wheels. With rollers attached to the pans, this continual wear did not take place; but greater provision had to be made for lubrication, which was more difficult owing to the rollers travelling with the chain. Another improvement made to the drag conveyor was the bevelling of the false bottom plates and guides, so that each plate or guide held down the end of the plate or guide in front of it—rendering impossible the rising of the plates to form projections against which the coke would impinge. With regard to the tests given by Mr. Angus, the great increase in the percentage of breeze and dust due to the use of a chute fixed at an angle of about 30° with the horizontal, as shown by Tests B and C, was surprising, and required some explanation. He should like to ask Mr. Angus whether the tests followed one another consecutively, what class of coal was undergoing carbonization, and whether the material collected for Test B passed over the end of the conveyor or was taken off before reaching that point. Coming to lubrication, something more was clearly necessary than the provision of means. No lubrication was automatic for indefinite periods; and unless careful supervision was exercised, it was provided for no purpose. Then, again, a good deal of the wear and tear was due to excessive use of water in quenching the coke. Coke dust was carried into the wearing parts if water was flowing about, thus nullifying the lubrication. He would call attention to one difference between coal and coke handling plants, so far as retort-houses were concerned. For coal, he thought it was necessary for the crushers, elevators, cross-conveyors (if any) and drives, to be in duplicate, because in case of a breakdown of a single plant it would be very awkward to have to adopt hoisting arrangements to lift the coal. For coke, however, it was not, in the majority of cases, requisite to duplicate the plant (unless it was the engines for driving same), because in case of a breakdown the coke could be diverted to the cellar-floor and wheeled away just as if there was no conveyor.

Mr. A. N. Comely (Windsor Street) remarked that there was one type of conveyor which the author had not had time to mention, and to which he would like to call the attention of the members—that was, the gravity-bucket conveyor. This was a type of which they did not see very many examples; but no doubt most of them were familiar with its general construction. He would, however, like to point out its chief advantages. It had a very slow speed, and consequently small wear and tear. The friction was not very great, because the whole of the weight of the chains and buckets was carried by rollers. Another point was that one avoided the necessity for chutes such as there were with an elevator and separate horizontal conveyor. Then it was simple, because there was only one set of driving gear as compared with two. As far as he was aware, the only disadvantage was the greater initial cost. There was one other matter he should like to hear something about—that was, the question of electrical driving. He knew that in England there were not many gas-works in which the plant was driven electrically; but perhaps this was due to a prejudice against introducing their rival into their works. There were, however, one or two examples of which he was aware. If they had a large retort-house such as he had in his mind, and say four sets of elevating plant, the advantage of being able to transmit power any distance by means of a couple of cables was a very great one indeed. Of course, they could have one central generating station, and transmit the current to any place where it was required. If there was anyone there who had had practical experience in electrical driving, for coal elevating plants in particular, he would be very glad to hear about it.

Mr. A. O. Jones (West Bromwich) said he would like to second Mr. Hewett in his remarks with regard to the elevator chain. Mr. Angus passed over band conveyors almost without consideration—regarding the little extra trouble in moving the tipping-carriage as an objection to this type. He (Mr. Jones), however, thought that the smaller initial outlay and the less cost of upkeep constituted advantages in favour of the band conveyor, which would offset the slight additional trouble in tipping. He also was surprised with regard to the coke results. The amount of breeze formed on the coke-conveyor seemed very small indeed. They usually associated large stocks of breeze which could not be got rid of with works having coke-conveyors in operation; but this evidently was a mistaken idea, as the test showed only a difference of 2 per cent. as compared with drawing in a barrow. Mr. Hewett's questions with regard to the tests would perhaps explain some of the reasons for this seeming discrepancy. As to lubrication, he thought grease lubricators did not possess any advantages over oil ones for the purposes referred to, because the rate of travel was so slow that it did not keep the grease properly melted, especially in the winter time.

Mr. F. J. Bywater remarked that the subject dealt with in the paper was of vital importance to gas engineers. He thought there was no doubt whatever that, in these days of superior education of the working classes, it would very soon become a matter of grave consideration to gas engineers as to whether they could get men to perform the excessive manual labour which conveyors were called upon to do. Wheeling hot coke and laborious work in connection with conveying coal, would call for attention; for he was convinced that in time men would not do it. It was therefore well that they, as young engineers, should have a subject like this brought to their notice. They should keep in view all the advantages that conveying plants possessed, and the advances that were from time to time being made. Mr. Angus had brought before them very good types; but he (Mr. Bywater) was sorry he had been so sparing of their time, because his long experience would have enabled him to advance many points which were of great importance in the working of conveyors. There were one or two matters about which he would like to ask. As to the crusher-rollers having to be of any particular kind for inclined retorts, he did not think this was very necessary, if one selected a useful sort. It was possible to get a roller that would crush the coal just as well for inclined as for horizontal retorts. They had it at Saltley, and got no trouble at all. The question of crushing the coal did affect the even charging of electrically charged retorts; and with regard to this, he thought, on looking at the crusher in fig. 1, that it should be possible without much trouble to arrange for the bottom rollers to be taken out. He agreed with Mr. Angus as to the advantages of using cast steel; the less cast iron that they had the better, both in the rollers and in the gear-wheels, unless the cast iron was of a very special nature, which was difficult to get nowadays. Certainly, the oak strips mentioned by the author had to be made of carefully chosen wood. The "Hack and Giles" chain was made (which Mr. Angus did not state) of manganese steel; and although when properly manufactured it was a splendid chain, cast steel was a very peculiar kind of material, and required careful watching. As to coal-conveyors, Mr. Angus might have given them more details, for there were many points which required very careful attention. The canvas belt mentioned by Mr. Jones was useful; but it was employed mainly in grain warehouses, where there was not much wear and tear. There were, however, some at Saltley which wore very well. The pan conveyor for coke was a splendid type. They had some links at Saltley which had been at work for ten or twelve years; and though it was an old conveyor, and rather heavy, it did not break the coke. The wear and tear, also, was very small indeed for a coke-conveyor—which, as Mr. Angus said, always was a big item in the matter of repairs. As to the coke tests, he was surprised at some of the results shown; and he would like very much to know with what coals the tests had been made. While supporting the author's statement that the conveyor *per se* did not break the coke to any great extent—only from about 2 to 3 per cent.—he imagined the coke dealt with by Mr. Angus must have been very fragile stuff to be broken to the extent shown by Table C. He thought there was an erroneous idea about this matter. Mr. Jones remarked that coke-conveyors were synonymous with huge stacks of breeze. That might or might not be. He (Mr. Bywater) did not agree with him entirely; for he contended that the breakage of coke that was ascribed to the conveyors was exaggerated. His own opinion was that the coke was broken and the breeze produced in other ways rather than by the conveyor. He would have liked to have heard something about the trolley system, where the coke was dropped either into trollies or baskets underneath the retort, and quenched, or else taken out in the yard and there dealt with. This was a very useful and efficient conveyor; and it gave very little breakage.

Mr. S. T. Smith (Walsall) said that he had had a little experience with conveying plant; and he heartily agreed with the author in what he had stated in his paper. As to the initial cost of conveyors being thought more of than the design, of course, the design was of the first importance; and in considering the design, it was necessary to take into account the wearing parts of the machinery and the facility with which they could be renewed. But he was afraid as juniors they had very little opportunity of going into these matters. He would like to call attention to the new regulations which had just been issued, as far as they bore upon the question of clearance between rails and elevator. On the subject of coal crushing, Mr. Angus said that "the uniformity of the crushed coal plays but a small part in the charging of horizontal retorts with West or Foulis machines." This might be right as regarded the operation of the machinery; but if they were going to have a mixture of nuts, coal crushed to a small size, and dust, it would affect the carbonizing results. Whatever type of charging machine was used, they required the coal to be broken uniformly, in order to get it thoroughly carbonized. Of course the more uniform the size to which the coal was crushed, the better would the electrical chargers work. Could Mr. Angus give them any particulars as to the lifetime of the oak strips, as compared with steel strips. At his works they had steel strips; and they were standing very well. He would like to know the lifetime and the cost of the two methods. As regarded coke

conveyors, Mr. Angus referred to the bar type. He would be very glad to hear whether he had found that one side of the chain stretched more than the other, and consequently one side became longer than the other; and whether with the solid stamped bar and link he got fractures of the bars. He (the speaker) fancied he did. His own experience was that the chain stretched on one side; and he was afraid Mr. Angus would find that the bars would break and the links would have to be renewed before they were thoroughly worn out. Mr. Bywater had referred to the breaking of coke. He (Mr. Smith) also thought that the conveyor had a lot of blame wrongly attached to it. How much coke was broken depended upon the type of setting. With inclined retorts, it depended on the height of the retort from the floor, and the way in which the coke was dropped; and with horizontals, to a great extent upon the speed at which the coke was pulled or pushed from the retorts. Then, of course, the nature of the coal had to be considered at the same time. Did the coal Mr. Angus used come from one colliery only, or was it a mixed coal that he had got his results from; and what sort of coke was he making?

Mr. J. H. Morris (Nechells) said he would like to couple his name with the other speakers in expressing their indebtedness to Mr. Angus. They had had pointed out to them in the paper many things which it would be well for them to keep in mind. Speaking of the gearing of a coal-crusher, the author had told them that he knew of cases where the caking of the teeth had caused the bursting of the crusher. Was it not possible that the gearing could be self-sustained, and then the strain would not be thrown from the wheels on to the cast-iron casing which carried the bearings?

Mr. Angus said it was so in some cases, he believed.

Mr. Morris (continuing) remarked that it was pointed out in the paper that contractors had practically in their own hands the design of plants. He thought the gas engineer should have a big say in the matter, as the contractors went on experiments, and these were not so reliable as the actual results of operations in a gas-works. Mr. Angus had given them in a few minutes knowledge which it might have taken them years to find out.

Mr. C. H. Carder (Tipton) asked if Mr. Angus could give the cost of repairs and maintenance of the plant—information which would make the paper much more valuable. He had been trying for some time to get data that would be reliable—not merely contractor's data—as to the cost of upkeep of conveyors. Of course, in these prosaic days everything resolved itself into a question of £ *s. d.* He believed Mr. Smith, of Walsall, could give some information on this point.

The President proposed a hearty vote of thanks to Mr. Angus for his paper, and the facts which he had laid before the meeting. There was, he said, one thing in regard to the design of toothed rollers for crushers. To his mind, a crusher should not be a crusher, but a breaker. It should not be an apparatus in which one crushed the coal to a powder, but rather one in which it was broken into small pieces.

Mr. J. H. Darrah (Nechells) seconded the vote of thanks; and it was carried with applause.

Mr. Angus thanked the members, and said the criticism had not been so keen as he had expected. Certainly there ought always to be at least one belt for driving. Pieces of iron were very liable to be with the coal; and then if the machine was geared direct to the engine, something had to go. He preferred a belt to a clutch. As to strips in an elevator, he had found oak to last nearly three times as long as iron. They were also a lot quieter in working. If care was taken with the joints, he had experienced no trouble; and he had used them for eight or ten years. Some people he knew preferred elm or ash; but as a rule he favoured oak, as it wore better. He quite agreed with Mr. Hewett that it would be rather an expensive item for contractors to supply detail drawings when quoting; but provision should be made in the specifications for detail drawings to be submitted for approval before any part of the work was put in hand. Regarding the materials used for crusher rollers, he had had experience with manganese steel and malleable cast and cast iron; and he had found that for cannel or coal of a hard nature, manganese steel was preferable. But for soft coal, such as some classes of Yorkshire and Staffordshire, he had had some good results from rollers made of specially chilled Scotch cast iron, which was only about one-half the cost of steel. With reference to remarks made upon the varying designs of crusher rollers to suit the different classes of coal, in his opinion this was a very large question, and one worthy of more consideration than was usually bestowed upon it. The speakers admitted that crushed coal should be of a uniform size, but were of opinion that the present crushers were quite suitable for the purpose. He begged, however, to differ with them in this respect. He had had considerable experience with coal from almost all parts of England on inclined retorts, and also in the crushing of coal through various designs of rollers; and he had now come to the conclusion that the question of suitability or unsuitability of coal for charging inclined retorts depended mostly upon the method by which the coal was crushed, and that the question of slip or creeping of coal in an inclined retort when properly charged was a bogus one. He quite agreed with what had been said that provision could be made on the crusher shown in fig. 1, so that the bottom roller and bearings could be detachable; but he must still maintain that to remove the bottom shafts from the crusher, as now designed, necessitated a deal of unnecessary labour and expense. With reference to Mr. Comely's remarks on the gravity-bucket conveyor, he did not deal with this type owing to the fact that it was one with which he had had very little experience, and because he believed it was not in very common use for coal or coke handling in gas-works. It had always seemed to him, however, that, should the carrying chains on this type of elevator and conveyor combined, break on top of the benches, and the whole lot come into the bottom, it would be rather an expensive and inconvenient item to repair them. He had had no experience with electrical drives for elevators and conveyors in a retort-house; but from the trouble experienced with dust, &c., in a retort-house, he should not think it advisable to recommend electrical motors for this position, though he had seen electrical drives on elevators and conveyors erected in warehouses giving every satisfaction. With reference to roller chains, he might say he had seen roller chains for this purpose; but as the rollers were inserted at the expense of the link bearings, the arrangement was anything but satisfactory. With regard to coke conveyors, he agreed that the wear and tear on the overlapping ends of both pan and tray conveyors was very excessive when carried on stationary rollers, owing to the sagging of the chains, and that travelling rollers attached to the chains overcame this. He might state, however, that this excessive wear on the pans could be overcome on conveyors with stationary rollers by designing the joints of the chain so as to act as a butt hinge, and only open one way, as this method completely relieved the trays of the pressure caused by the sagging, and kept the chain and trays perfectly level. With reference to bar conveyors, he had had the same experience as that referred to by Mr. Smith. The chains invariably stretched on one side, which loosened the bars when riveted through the solid links; but this he found could be overcome, to some extent, by cutting the chain into segments, and turning every second length so as to equalize the tension on the two strands. But even then the bars loosened; and when re-riveted up tight, they invariably broke at the neck where reduced to act as a shoulder. Eventually, however, this trouble was completely obviated by stamping the bar and the links in one piece, and strengthening the necks of the bar by means of a large fillet. With this and the other improvements mentioned in the paper, though they had about 1600 feet of this chain in constant use, they had exceedingly little trouble, and had in some cases been able to convey over 40,000 tons of coke without a single breakdown. With regard to the coke tests submitted, the figures were the average weights and percentages of two tests both made with one class of coal, which was thoroughly carbonized. In the first test, marked A, the coke was collected by barrows from inclined retorts on the discharging-stage; in the second test, marked B, the coke was collected at a point before arriving at the end of the conveyor; while in the third test, C, the coke was collected from the floor at the bottom of the chute marked C. Of course, he quite agreed that these figures would vary considerably with different classes of coal. With regard to lubrication, he mentioned this matter simply to show a mechanical defect usually found in bearings; but he might here state that it had been his experience to find that a very large percentage of wear—especially on coal plants—was due to want of lubrication. He certainly preferred grease to oil, as it was more economical, and less liable to run and collect dust; and in a retort-house there should be no question of freezing. With regard to the cost of conveying plants, both initial and upkeep, he could only refer Mr. Carder to the paper read by the late Mr. W. R. Chester, of Nottingham, at the Engineering Congress held in Glasgow in 1901.

SCOTTISH JUNIOR GAS ASSOCIATION.

Western District.

The Annual General Meeting of the Scottish Junior Gas Association—Western District—was held in the Glasgow and West of Scotland Technical College, George Street, Glasgow, last Saturday evening. Mr. J. Bell, of Airdrie, the Retiring President, took the chair. The attendance was very good.

After the transaction of formal business,

The President said he thought everyone would be satisfied with the balance-sheet, which showed a credit balance of £15.

Election of Office-Bearers.

The office-bearers for the year were elected as follows:—

President.—Mr. J. M'Leod, F.I.C., of Provan.

Vice-President.—Mr. W. Wilson, of Kirkintilloch.

Members of Council.—Messrs. James Byres, of Glasgow; John Wilson, of Glasgow; John Smith, of Glasgow; Alex. Dow, of Kirkcaldy; T. Orr, of Motherwell; and J. Bell, of Airdrie (*ex officio*).

Hon. Secretary and Treasurer.—Mr. G. Braidwood, of Dawsholm.

Auditors.—Messrs. John Smith and James Mann, of Glasgow.

Access to the College Library.

The Hon. Secretary read a communication from the Secretary to the College, intimating that the Governors had resolved to open the library to members of scientific societies meeting within the College, on the same conditions as to students—viz., the payment of a registration fee of 1s. by each member.

Mr. A. Wilson (Glasgow) suggested that the Secretary should be instructed to write and thank the Governors for the offer, and accept it. He was sure the privilege of using the library would be a great boon to the members of the Association, who would be able to consult books which they might have difficulty in getting otherwise.

Mr. S. B. Langlands (Glasgow) was in favour of the Association contributing to the library what books they might have. He had intended to move that there should be an assessment of 1s. per member for procuring books for themselves. In this way, they would not be dependent upon anyone.

This suggestion was remitted to the Council to be dealt with.

A Question of Medals.

Mr. W. Wilson (Kirkintilloch) said that his election to the office of Vice-President placed him in an awkward position, because, while he was very sensible of the honour done him, and felt exceedingly gratified that he had been put forward unanimously, he came there with the intention of proposing that they might provide a gold medal for the President, and that the resolution should be made retrospective. Although it might come badly from him now, he moved to this effect.

Mr. J. Lowe (Glasgow), with the view of testing the feeling of the meeting, moved that no medal be granted. The question came before the Council several times while he was President; and they did not think it advisable to give medals. For one thing, they did not know how the funds would turn out, and the money might be spent otherwise quite as well.

By 14 votes to 12, it was decided that no medal should be given.

Mr. J. Allan (Glasgow) moved that a medal be given to the reader of the best paper.

Mr. A. Wilson said, in order to clear the air on the subject, he had much pleasure in offering a medal to the reader of the paper which the Council might consider best.

After discussion, it was agreed that the medal be awarded by a Committee of three honorary members, who would be selected by the Council; and on the motion of Mr. D. Vass (Airdrie), Mr. Wilson was thanked for his promise of a medal.

President's Retiring Remarks.

The President said he thought they had reason to congratulate themselves upon the past session's work. In every department, success attended them. He was pleased to notice that the majority of the papers read raised very interesting discussions. The success of the visits they paid was fully demonstrated by the large turn-out they had at each of them. He had to thank the members of the Council for their hearty co-operation in carrying on the business of the Association, and especially his esteemed friend their Honorary Secretary, who was the hardest-worked person in the Association, and to whom the thanks of every member were due for the very excellent manner in which he filled that most important office. Mr. M'Leod, their new President, was well known to them all, and required no introduction from him. He had been an enthusiastic member, and a regular attendant at all the meetings. With such able generalship at the head of the Association, coupled with a first-class syllabus, they would hope that the session on which they were entering would be a record one. He had much pleasure in calling upon Mr. M'Leod to take the chair, and to proceed with his address.

Mr. M'Leod having taken the chair, asked the members to accord to Mr. Bell a very hearty vote of thanks for the very energetic way in which he had fulfilled the duties of President.

This was cordially agreed to, and Mr. Bell returned thanks.

PRESIDENT'S ADDRESS.

The President then delivered his Inaugural Address, in the course of which he said:

I thank you very heartily for the honour you have done me in electing me your President for this session. I trust that under my guidance the Association will maintain the high position it has attained during the past two years. Your Committee have prepared a very good syllabus; and with your hearty co-operation, I think we may have a most successful year. I have chosen as the subject of my remarks to-night the "Scrubbing of Coal Gas"—a simple subject one might say; but we all know that in gas making the apparently simple is often the really complicated. "Any old Irishman can manage a gas-works," was the assertion made to me on a recent occasion by a town councillor. Yet some of the brightest intellects in the kingdom have not thought gas problems beneath them; and these would be the first to admit that there were still many unsolved problems in gas manufacture. I do not know that I shall be able to throw any new light on this subject; but trust I may be able to interest you for a short time.

Coal gas is scrubbed, as you are aware, with water and ammonia liquor, in order to recover the valuable bye-product ammonia, and to eliminate to some extent at least the carbonic acid, which depreciates the illuminating power so much (different authorities, by the way, giving one marvellously different figures for the amount of that depreciation). The sulphuretted hydrogen and other sulphur compounds are also slightly reduced by the scrubber. This idea of scrubbing the gas was not reached at once in the progress of the gas industry. At the beginning of the industry, considerable doubt existed as to the wisdom or otherwise of scrubbing the gas at all; but now, of course, the scrubber is regarded as indispensable. The doubt arose, as you might think, through the belief that the illuminating power was lowered through contact of the gas with the water in the scrubber; and undoubtedly some of the illuminating hydrocarbons are deposited there. Against this, however, must be placed the recovery of the valuable ammonia, and the partial removal of carbonic acid, sulphuretted hydrogen, bisulphide of carbon, &c.; thus relieving to some extent the work of the purifiers. In 1875, Hughes wrote that "formerly the ammoniacal liquor of the gas-works possessed but little value on account of the large quantity of water intermixed with it; and in some cases where pure water was used for the scrubber the greater part of the ammonia was entirely lost." It is not quite clear what Hughes meant by this; but in any case it is interesting to note how the point of view has changed since then.

Briefly put, the action of the scrubber depends on the relative solubilities of the various gases present in crude coal gas in water; on the mass or amount and nature of the various gases; on the chemical affinity of those gases for each other in the gaseous state and in solution; and on the temperature and pressure. The importance of the pressure in determining the amount of the impurities dissolved in the water is fully borne in on one, when drawing off measured volumes of the liquor by means of the pipette, as I had to do a few scores of times in the tests for this address; the slight reduction in pressure due to the suction being sufficient to produce in one's mouth a taste which, as Sam Weller remarked about the waters of Bath, is "particklery unpleasant." As an example of the immense difference the temperature makes in the amount of a gas dissolved by a liquid, it might be mentioned that a difference of 25° Fahr. means a difference of about 10 per cent. in the amount of carbonic acid dissolved in 100 volumes of water. The necessity therefore of having the gas reasonably cool on entering the scrubber is obvious. During the last month, the average temperature of the gas entering the Walker scrubbers at Provan has been about 64° Fahr.

The gaseous impurities we wish to reduce or entirely eliminate in the scrubber are all fairly soluble gases; ammonia being the most soluble of all gases in water—100 volumes of water at 32° Fahr. dissolving 114,800 volumes of ammonia. Why, then, if these gases are soluble, does the water of the scrubber not remove all of them from the crude gas? Bearing in mind's Dalton's law of partial pressures, the reason that the whole amount of all these gases is not dissolved is simply that the quantity dissolved is proportional to the partial pressure of each gas. This might be shown more clearly by taking the crude gas as having the following composition:—

	Per Cent. Vol.
Carbonic acid	4·4
Sulphuretted hydrogen Carbon disulphide	1·3
Ammonia	0·3
Cyanogen	0·13
Carbon monoxide	9·2
Benzene	0·5
Olefines, &c.	4·4
Methane	36·6
Hydrogen	41 2
Nitrogen (difference)	1·097

In a gas of the above composition then, the amount of ammonia dissolved, and of the other gases also, would be proportional to their partial pressure as shown by their percentages. Thus, instead of 1 volume of water dissolving 764 volumes of ammonia at 60° Fahr. when brought in contact with a gas of the above composition, it will only dissolve $\frac{3}{1000}$ of that amount. The quantities of the impurities present in the crude gas and in the scrubbed gas vary within wide limits. Thus, while these tests were going on, the sulphuretted hydrogen ran from 445·9 to 817·5 grains per 100 cubic feet in the crude gas; and the percentage removal of this impurity varied from 1 to 33 per cent. The carbonic acid in our crude gas is higher than any figures I have seen published, having been as much as 3647 grains per 100 cubic feet; the lowest test showing 2478 grains per 100 cubic feet. The percentage removal of this latter impurity varies from 10 to 60 per cent.

At the highest proportion of carbonic acid yet found at Provan, the percentage removal was 21 per cent. The ammonia in the crude gas has varied from 50·5 to 127·4 grains per 100 cubic feet. The causes of these variations might be summed up as the nature of the coal carbonized (whether the coal is wet or dry when charged) and the temperature of distillation. All of these three causes, but especially the last, exercise a strong influence on the amount and nature of the impurities contained in the crude gas. The cyanogen in particular, being a high temperature product, is subject to big fluctuations; and this at once tells on the time taken to work up the cyanide liquors in the Holmes scrubbers. I might mention here that a recent test showed the almost complete removal of cyanogen from the gas; only a mere trace remaining in the gas, which could not be estimated. The entering gas contained 66 grains per 100 cubic feet.

The complete removal of the ammonia from the crude gas cannot be effected without decreasing materially the amount of carbonic acid and sulphuretted hydrogen absorbed; but this latter is probably a minor consideration to the recovery of the maximum quantity of ammonia. In works where oxide only is

used for purification, I believe that if the scrubbed gas stands a second or two's exposure to red litmus paper without the paper showing change of colour, then the point of maximum scrubbing efficiency has been obtained, provided, first, that a standard illuminating power has to be maintained, and, secondly, that no enrichment is being used. In the case where enrichment is being employed, it is just a problem whether the trifling increase in the enriching material used would counterbalance the leaving of a small trace of ammonia in the gas. The methods employed in determining the carbonic acid and sulphuretted hydrogen were Wright's, an iodine method, and a combination of volume measurement and titration; this latter being extremely rapid and apparently accurate. Into a discussion of these I hope to enter at some other time and place.

In order to throw some new light, if possible, on the action of the scrubber, I have determined the amounts of carbonic acid, ammonia, sulphur, and hydrocyanic acid in each of the twenty compartments of the Walker's scrubber, or purifying machine, as it is called. I do not recollect having seen an attempt made to trace the action of this apparatus in this way; and it may be of interest to you. The two scrubbers are worked in series, the gas passing through both. Fresh water runs into the outlet or No. II. scrubber at the average rate of 5¼ gallons per ton of coal carbonized. The overflow of this No. II. scrubber runs into a small well at the side of the scrubber, and is pumped, by means of a small pump attached to the crank of the scrubber driving engine, up to the top of No. I. scrubber. Liquor from the hydraulic main and condensers is also pumped into this No. I. scrubber, to be worked up to a suitable strength. I have summed up in tabular form the results of the analyses of the twenty samples. The results in the table are expressed throughout in grammes per 100 cubic centimetres. The strength of the liquor in the various compartments and overflows, as indicated by Twaddel's hydrometer at 60° Fahr., show a constant, but not quite regular, decrease, except in the top two compartments of No. I. scrubber, where, as I said, in addition to liquor from the overflow of No. II. scrubber, virgin liquor is also flowing in, thus reducing the strength of the liquor in these two compartments.

	Degrees Twaddel at 60° Fahr.	Carbonic Acid.	Ammonia.	Total Sulphur.	Cyanogen as Cyanide expressed as Hydrocyanic Acid.
Overflow	13·5	8·265	5·953	·302	·036
No. 1 Chamber	12 1	7·786	5·513	·352	·041
,, 2 ,,	11·5	7·254	4·971	·349	·038
,, 3 ,,	10·1	6 999	4·566	·343	·034
,, 4 ,,	9·5	5 876	4·088	·337	·034
,, 5 ,,	8·6	5·219	3·602	·335	·032
,, 6 ,,	7·4	4·482	2·901	·337	·035
,, 7 ,,	6·2	3 847	2 561	·341	·036
,, 8 ,,	5·2	3·118	2·186	·328	·050
,, 9 ,,	4·5	2·720	1 844	·309	·044
Overflow, No. 2 Scrubber N.S.	5·4	3·327	2·174	·273	·037
No. 1 Chamber	5·0	3·094	1·946	·266	·016
,, 2 ,,	4·2	2·566	1·476	·211	·047
,, 3 ,,	3·4	2·077	1·289	·205	·051
,, 4 ,,	2·8	1·708	1·032	·136	·056
,, 5 ,,	2·1	1·549	0 782	·164	·064
,, 6 ,,	1·7	1·092	0·601	·133	·065
,, 7 ,,	1·2	0·780	0·413	·097	·068
,, 8 ,,	0·6	0·461	0·268	·085	·068
,, 9 ,, Last chamber through which the gas passes.	0·0	0·230	0·119	·048	·058

The carbonic acid, as will be noticed, is present in large amount—larger than will be seen in the published results of Mr. Linder's work on English gas liquors, as shown by the report for 1905, published in 1906, of Mr. Carpenter, the Chief Inspector under the Alkali Works Regulation Act. To Mr. Linder the thanks of all interested in the subject of the composition of gas liquors, and more especially those with a "blue salt" problem to face, are specially due for his work in elucidating this problem. The impossibility, then, of the gas liquor produced at the Provan works containing a large proportion of sulphur, is evident from this table showing the large proportion of carbonic acid present. The average of six samples (Table A., pp. 35-36, Alkali Report, 1906), as shown by Mr. Linder, gives 0·752 grm. of total sulphur with a strength of 5·6° Twaddel. The strongest liquor in the above table, which is 13·5° Twaddel, only contains 0·302 grm. total sulphur, and the highest in total sulphur 0·352 grm. per 100 c.c. I might give here an analysis of a sample of gas liquor from a storage tank at the Provan Chemical Works.

Degrees Twaddel at 60° Fahr.	4·1
Total ammonia	1·912 grms. per 100 c.c.
Free ammonia	1·814 ,, ,,
Fixed ammonia	0·107 ,, ,,
Total sulphur	0·1494 ,, ,,
Carbonic acid	2·274 ,, ,,
Hydrocyanic acid	0·0357 ,, ,,
Chlorine as hydrochloric acid	0·109 ,, ,,

The total sulphur in this sample is only 0·1494 grm. per 100 c.c.; the carbonic acid being high. The ammonia, as will be seen, shows also a constant, but not quite regular, decrease, through the twenty tests, with the exception of the chambers already mentioned. The cyanogen existing as cyanide and expressed in terms of hydrocyanic acid shows an interesting variation. The strongest liquor contains 0·036 of cyanogen as HCy; and the weakest liquor shows 0·058 of cyanogen as HCy. This apparent anomaly might be explained in two ways—viz., that the carbonic acid being in such large amount has displaced the cyanogen, sending it forward to be caught in the weaker liquor; or that the polysulphides present in the strong liquor has attached the ammonium cyanide with formation of ammonium sulphocyanide. The latter is the better explanation of the two, though both may hold good.

One thing I should like to say—that, in view of the considerable amount of cyanogen retained in the liquors, the present position of the cyanide scrubbers in the Foulis process, after the ammonia scrubbers, does not seem to me to be quite justified by the contentions that a purer product is obtained and less ammonia is lost on boiling down the cyanide liquors, and less insoluble cyanide is formed than would be the case if the cyanide scrubber came before the ammonia scrubber. There is always some ammonia in these liquors of the Foulis cyanide process. Tests showed an increase of ammonia at the outlet of the cyanide scrubbers, though the gas was free from ammonia on leaving the ammonia scrubber.

The President described, with the aid of lantern slides, the three types of machine used in the Glasgow Gas-Works for scrubbing gas—Walker purifying machines, Holmes scrubbers, and "Standard" scrubbers of Messrs. Kirkham, Hulett, and Chandler. He concluded with the remark: It is, perhaps, not the custom for the President's Address to be open for criticism; but I shall follow the good example set by Mr. Bell last year, and invite remarks from any member present who may have anything to say on the subject.

Discussion.

Mr. D. Vass said he was struck with one remark made by the President with reference to their manner of working—that was, that they ran the hydraulic main liquor into the scrubber, and used it for scrubbing the gas. He himself had now managed to introduce this method of working at Airdrie. He tried to do it in his former works; but, owing to the scrubbing plant being so much higher than the hydraulic main, it was impossible. For the last two years, however, he had been doing it very successfully in a spare tower scrubber they had. He was surprised to hear that in some other works they had abandoned the method, on the ground that it did no good. This was not his experience; and he was pleased to hear that he had been working on right lines. He separated the liquor entirely from the tar, and ran it in at the bottom of the scrubber. After passing from this vessel the gas was purified in a Holmes scrubber, where only fresh water was used. There was no hydraulic main liquor run in on the second occasion, so that they had a safeguard. He did not know that it would be a safe thing to use except where they had an absolutely clean liquor coming in, in a separate scrubber entirely.

Mr. W. Wilson thought possibly there was nobody present who was able to criticize the address, which he had enjoyed from start to finish. He was not going to criticize, because he could not do so; but Mr. Vass had reminded him of what they did at Kirkintilloch. He was one of those who had tried to use the natural liquor from the hydraulic main, and had failed, from several causes. The primary one was a bad separator, to separate the tar from the hydraulic main or its natural liquor. The result was that when they tried it they got tar into the scrubber. On this account he had had to discard it altogether. He would ask the President, as bearing upon this subject, if at Provan they cooled their natural liquor; to what temperature they did so; and what means he employed for cooling it. As they all knew, it was not good to scrub with hot water.

Mr. W. Blair (Helensburgh) said he had worked for a great many years on the same lines as those which the President had described. He had been told that he was doing wrong in using the mother liquor. At present he had a very good storage-tank, and he used it as a separator and storage for tar and liquor. His practice was to work up the liquor from the condensers first, and use fresh water afterwards. He had a different set of dip-pipes for pumping the liquor and the tar, and he always got his liquor free from tarry matter. At some seasons of the year he had a difficulty in getting it cool enough. He had no trouble in extracting all the ammonia that water could take up. He had a tower-scrubber, filled with boards, and then a Holmes washer-scrubber of 500,000 cubic feet capacity per day; and the whole of the ammonia could be taken out with this, if the liquor could be got down to from 60° to 65° at the entrance to the scrubber. The whole of the liquor from the washer-scrubber passed right into the tar-well.

Mr. P. M'Dougall (Helensburgh) said the President had dealt with a very important subject. In washing crude coal gas, it was essential that the temperature should be kept as low as possible, having regard to the illuminating vapours. To ensure that the equilibrium should be established between the gas and the water as quickly as possible, the surface stratum should be changed periodically. He thought it was also good that the strong liquor should be separated from the weak.

Mr. A. Wilson added his meed of thanks to the President for his very able address. He was quite delighted to think that Mr. M'Leod had carried out the work so carefully as he had done. They did not always get time for such investigations in their ordinary business. Some of the reasons for adopting the arrangements at Provan were that by their ordinary methods, at the other works, the liquor was rather weak, due to the hydraulic main liquor being mixed with that coming from the scrubbers, which

reduced its strength. A large volume of liquor of low strength had to be pumped. At Provan they arranged to put down a separator at the condensers, to separate the liquor from the tar. It took some little time to find the proper levels at which the liquor and the tar ran away, but now the method worked very successfully. The liquor from the hydraulic main being put into the second scrubber had not only taken away the weak liquor, but they used a great deal less water, and in this way they had reduced the quantity of liquor which had to be pumped up to the tar-works, which was certainly a great gain, and gave the chemical contractors very much less work to do in their towers for the removal of the ammonia from the liquor.

Mr. J. W. Popplewell (Glasgow) thought the President had expressed the feeling that he would get a larger yield by placing the cyanogen scrubber in front of the ammonia scrubber. He would like to ask the President his opinion as to the ultimate yield of ammonia, and whether this would minimize it or otherwise. He was rather of opinion that it would.

The President, in closing the discussion, said Mr. Vass, Mr. Blair, and Mr. William Wilson had followed pretty much on the same lines; and what he said of one applied to them all. Of course, it was of the first necessity that gas should be reasonably cooled. As Mr. M'Dougall had mentioned, it must not be chilled unduly, because they then brought in the deposition of the hydrocarbons. It was absolutely necessary that the tar should be separated from the ammoniacal liquor. If they allowed tar to get in among the boards of the scrubber, it was a very difficult matter to deal with. The liquor must be cooled, because, as he pointed out, the difference made in the absorption of gas by a comparatively small difference in temperature was very great. It was interesting to know that the gentlemen named were working on these lines. So long as virgin liquor was reasonably cooled, there was not the slightest reason why it should not absorb ammonia and other gases. If the tar were not properly separated, or if the liquor were used too hot, there would be a decrease in the quantity of gas which would be absorbed. It was necessary to separate the strong liquor from the weak; and this was done in the mechanical scrubbers by having different compartments. Ammonia would come off in almost any solution. It tended to free itself from the solution, and to bring about a state of equilibrium between it and the other substances present. He had to thank Mr. Wilson for his kind remarks about the address. As to Mr. Popplewell's question regarding the amount of ammonia lost, on the whole the answer would be that the ammonia might possibly be greater. But, as he knew, it was a very strongly alkaline solution—alkaline with a stronger base than the ammonia; so that the total amount of the ammonia absorbed, provided the cyanogen scrubber were placed in front of the ammonia scrubber, would not probably be very great. Of course, it would be probably worth while to recover even this small amount of ammonia dissolved in the liquor, and it would not, he thought, be a great engineering feat to recover it. It was rather a serious thing when they found that 100 c.c. of gas contained from 0·036 to 0·058 gramme of cyanogen. This was a valuable commodity, and if they could get more of it the better it would be for the gas concern. He should like to thank his chief, Mr. Webster, for the interest he had taken in the work done for the address, and also his Assistant, Mr. Graham, for showing the slides.

Mr. Lowe proposed a vote of thanks to the President for his address. He had given them, he said, much more than an ordinary Presidential Address; and it would be a very valuable addition to the Transactions of the Association.

The President briefly returned thanks, and the meeting closed.

Programme for the Session.

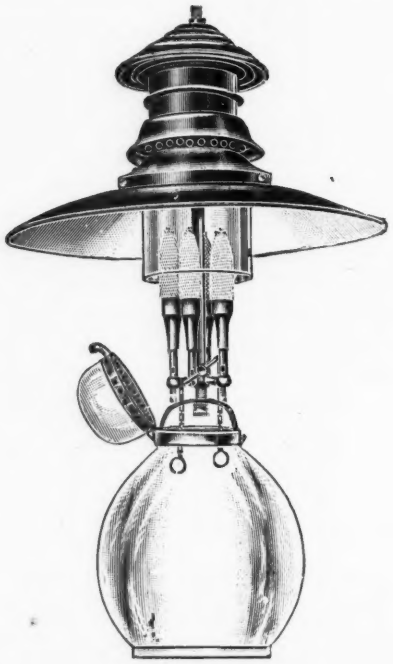
The programme arranged for the remainder of the session is as follows: Oct. 27, visit to the New Grange Meter-Works, Edinburgh. Nov. 10, papers on "Stoking, Past and Present," by Mr. J. Fraser, of Provan, and "Carbonization," by Mr. Peter M'Dougall, of Helensburgh. Nov. 24, visit to the Earnock Colliery. Dec. 8, paper on "Treatment of Blast-Furnace Gases," with limelight illustrations, by Mr. J. Gillespie, of Glasgow. Jan. 12, 1907, papers on "Gas-Turbines," by Mr. J. Wilson, of Glasgow, and "Coal-Tar Distillation," by Mr. J. W. Popplewell, of Provan. Jan. 26, visit to the Bonnyside Fire-Brick Works, Bonnybridge, and a paper (to be read at the works) on "Fire-Bricks and Retorts," by Mr. E. M. Stewart, of Bonnybridge. Feb. 9, paper on "Laying Out of Gas-Works," by Mr. R. A. Campbell, of Provan. Feb. 23, visit to the Phœnix Tube-Works. March 9, a lecture on "Flame Temperature," by Professor Gray, D.Sc., Ph.D., of Glasgow. March 23, visit to the Philpstoun Oil-Works.

A reinforced concrete stand-pipe, 50 feet in diameter, 106 feet high from the inside of the bottom of the tank to the top of the cornice, and with a capacity of 1½ million gallons, has been completed, and is in service in the water-works of Attleborough (Mass.).

In the "Journal" a fortnight ago, reference was made to the investigations carried out by Professor Wertheimer, the Principal of the Merchant Venturers' Technical College, Bristol, on the subject of the use of the divining-rod in locating water. We regret to learn that the Professor's valuable library has been destroyed by the fire which occurred in the building last Tuesday.

THE "RADIANT" LAMP.

One of the best lamps that the Wholesale Fittings Company, Limited, of 30, Commercial Street, E., have placed on the market for outdoor use is, of course, their latest, as it embraces the advantages to which experience has given birth. It is called the "Radiant;" and it combines three features which produce these benefits: Accessibility is given for the cleaning of the globe in a simple way, protection is afforded the mantles, and the illuminating power is increased by the constructional arrangement of the lamp. Regarding, in the first place, the accessibility of the globe for cleaning, the telescopic pendant (on which the globe generally slides) has been abandoned, and consequently there is no side frame for the casting of shadows. The globe is simply suspended and inverted from the base of the central rod, as depicted in the illustration; and thus without removal from the lamp—thus avoiding breakage—it can be cleaned rapidly, safely, and with ease from below instead of from above. This is a great convenience. While referring to the globe, it should also be mentioned that there is no copper or other metal cup at the base; but only a clear glass cup; and so there is no impediment to the downward rays of light. Therefore no shadows are cast. The glass cylinder (which will be observed in the illustration) round the mantles serves a two-fold purpose. It protects the mantles while cleaning the globe, and also shields them from draughts to which the lamp may be under ordinary circumstances exposed. But beyond this it increases the up-draught from the base; and this enhances the incandescence of the mantles. It will also be seen that the mantle renewals can be easily effected. The burners are of heavy cast brass; and the body of the lamp is of steel, enamelled green and relieved with gold lines. It is a good looking lamp.



The "Radiant" Lamp.

The Company's collection of mantles, glassware, fittings, and lamps—with vertical and inverted burners, and single or in clusters—is remarkably varied; and they have several neat novelties. Nothing short of a catalogue can give them notice; and into the new catalogue which the Company have issued, they have packed an immense amount of information as to their wares. The "Rex" cluster inverted burner (for four or five mantles), which can be fitted to the upright service-pipes of ordinary street or other outdoor lamps, is one of the latest additions to the fittings worthy of special attention. A lantern devised particularly for this burner is also shown; and the combination is known as the "Rex" lamp. The consumption of gas is only about 8 cubic feet per hour, and a light of 300 candles is claimed. The mantles being suspended from four curved arms, there is little interception by any one of the light of the others—in fact, a considerable part of the surface of all four of the mantles is brought into effective use.

We learn that on the 27th prox., at St. Mark's, Sheffield, the marriage will take place of Mr. W. A. M. Valon, the Assistant-Engineer at the South Shields Gas-Works, with Miss Edith Robinson. Mr. Valon is the third son of Mr. W. A. Valon, and he went to South Shields in June last from Sheffield, where he served his articles with Mr. J. W. Morrison, the Chief Engineer of the Sheffield Gas Company. We cordially wish him happiness and prosperity.

REMOVAL OF NAPHTHALENE FROM COAL GAS.

By Alfred H. White and Joel M. Barnes.*

[Paper presented at the Meeting of the Michigan Gas Association.]

The present paper is the sixth to be presented to the Association as the result of your support of a Fellowship in Gas Engineering at the University of Michigan. The study of the removal of naphthalene from coal gas has formed the subject of research reported upon at your last two meetings,† as it is also the subject now to be presented. Though the title is thus a restricted one, it is really the whole system of condensation in the gas-works which is under investigation and discussion.

The report presented last year brought out two conclusions of importance. The first was that incomplete removal of tar before the gas was brought into contact with water in the scrubbers was responsible for most of the naphthalene troubles in the later portion of the works and in the city mains. It was shown that the ammonia dissolved the phenols, liberating in free form the naphthalene previously dissolved in the phenols. The other conclusion of importance was that the tar was not only the most powerful, but practically the single, agent effective in the normal removal of naphthalene in the condensing system; and that so powerful was this agent, that at no point in the condensing system did the gas contain more than a small fraction of the amount which gas could hold if fully saturated at the temperature of the main when no tar was present. From the evidence of our tests, it seemed apparent that if in the works examined all the tar had been removed by the Pelouze and Audouin separator at the proper temperature, there would have been little possibility of naphthalene stoppages at a later period.

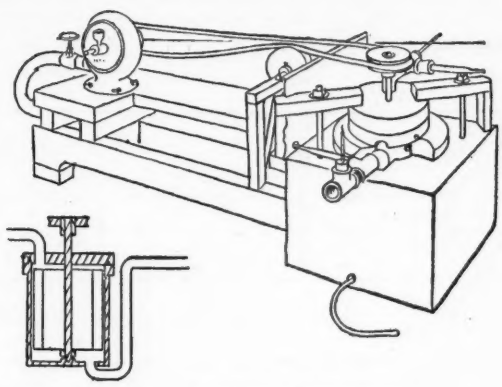
Attention was directed by us to a possible source of error due to the method employed for separating the gas from the mist-like particles of tar held in suspension. This was accomplished by introducing into the gas-main a glass tube containing asbestos fibre, and aspirating a cubic foot of gas through this and then through an absorption train containing picric acid. The naphthalene in the picric acid tube was assumed to be that present in the gas in the vapour state, while that retained by the asbestos indicated the amount dissolved in the suspended tar. In all the tests, a portion of the sampling tube projected into the main, while the rest of its length was in the outside air. In all except the tests on the stand-pipes, the portion within the gas-main was long enough to collect all the separated tar, so that there was no scrubbing of gas with colder tar.

There are, however, two possible sources of error. First, if there is not equilibrium in the gas-main between the naphthalene as vapour and that dissolved in the tar, scrubbing with the separated tar will help to bring about this equilibrium. The results obtained will be those which would have been realiezd in practice had the gas been agitated or passed through baffle-plates in the main to hasten equilibrium. The other source of error is due to the cooling of the gas in that portion of the glass tube outside the main. It is possible that the temperature might be lowered enough to freeze out naphthalene or light oils which would dissolve naphthalene. It is apparent that this error will be the greater the greater the temperature difference between the main and the surrounding air, and the longer the time during which the gas is exposed to this cooling action. Both of these errors work in the same direction, and tend to cause the naphthalene in the gas to be reported lower than it should be.

The most serious reproach which can be brought against the conclusions previously reported is that perhaps they represent results which might have been obtained by proper frictional scrubbing and cooling rather than conditions actually prevailing. The smaller amount of tar and the nearer the system comes to room temperature, the less will be any error of this sort; and it may safely be assumed that the errors are negligible beyond the secondary condenser. We have heard no objections raised against our conclusions of last year concerning the action of the scrubbers. Such data as have presented themselves during the present year's work confirm our previous results; but we have not carried our investigations much farther in this direction. It has been taken for granted that in practice it is desirable to remove the largest possible amount of suspended tar prior to the arrival of the gas at the scrubbers; and we have studied especially the conditions surrounding the removal of this suspended tar in the condensing system, with reference to the influence of temperature and length of contact upon the relative amounts of naphthalene held as vapour in the gas or dissolved in the tar.

The Experimental Centrifugal Tar-Separater.—The Pelouze and Audouin tar-separator is a pivotal point in most condensing systems; and we desired especially to investigate it further, with a view to confirming or disproving the conclusions announced last year. In view of the fact that there was a possibility of an error in method which might be serious, it was evidently extremely desirable to repeat the experiments in an entirely different way, which should not contain the objectionable feature of scrubbing the gas with separated tar.

The ideal arrangement requires a device to instantaneously separate the suspended tar and water globules from the gas without altering their temperature, or subjecting them to other changes which might cause any disturbance of the quiet relations which existed between the gas and the suspended particles prior to their instantaneous divorce. It was decided that a small high-speed centrifugal separator, while not fulfilling all the requirements, afforded the most practicable means of approximating the desired result. It was hoped by means of such a machine to separate the suspended globules rapidly and with a minimum of scrubbing action, and to deliver the gas from the machine in a condition to be tested for the naphthalene vapour which it might contain. We found on record experiments from which we could derive aid in designing such a miniature machine; and for the benefit of others we present a sketch of it as it stands.



Experimental Centrifugal Tar-Separator.

The starting-point was a bronze tar-still, $5\frac{7}{8}$ inches internal diameter and 9 inches internal height. A $\frac{3}{4}$-inch pipe was inserted in the bottom for an inlet, and one of similar size in the top for an outlet. A sheet-iron drum, 4 inches in diameter, with radial vanes $\frac{3}{4}$-inch long and with proper clearance top and bottom, was put in the centre of the cylinder. When the machine was in operation, the gas entered at the bottom, passed upwards through an annular space where the blades whirled it rapidly round, and finally passed out at the top. When running at a speed of 1500 revolutions per minute, and drawing gas through at a rate of 1 cubic foot in 20 minutes, this machine removed 95 to 98 per cent. of the suspended materials. Inspection of the machine after a test showed that the upper third of the cylinder wall was almost entirely bright and free from tar, so that the tar must have been thrown out in the lower two-thirds of the machine. The illustration shows the way in which it was mounted and connected by a belt to a Pelton water-wheel, and also gives an approximate idea of its construction, but does not show the jacket over the top, which has been removed in order to better show the arrangement of the machine. This jacket was made of galvanized iron in sections, so that it could be put in place after all connections had been made. It covered the entire top of the machine, including the tar-sampling tubes which are shown in position; the inlet-tube, with its thermometer, in the foreground. The bottom portion of the machine was much more efficiently jacketed than the upper part, as it was placed in a water-jacket, and further protected by asbestos tacked to the frame.

Tests with the Centrifugal Tar-Separator at the Inlet of the Pelouze and Audouin Separator.—In addition to the preliminary tests with the centrifugal machine, which were defective for one reason or another, and which are all rejected, three sets of tests at the inlet of the Pelouze and Audouin tar-separator are available for discussion. These were made at the Ann Arbor, Detroit, and Saginaw works. To illustrate the manner of making the test, we will describe somewhat in detail the method employed. The centrifugal machine was placed as close to the inlet of the Pelouze and Audouin separator as the arrangement of the works allowed, and was connected to the main by a $\frac{3}{4}$-inch pipe. As it was the intention to determine the effect of removing the tar without changing the temperature of the gas, the greatest pains were taken to keep the temperature of the machine constant, and at the same temperature as that prevailing in the main from which the gas was being drawn. The connecting-pipe was jacketed with a 3-inch tin pipe, connecting by a sleeve with the jacket surrounding the centrifugal machine, so that when steam was blown into this jacket to keep the temperature up it also passed through the jacket along the connecting-pipe. Three thermometers were placed within the jacket of the machine. One projected through a T-piece directly into the gas as it entered the machine; another in a similar T-piece showed the temperature of the gas as it left the machine; while the third indicated the temperature of the water-jacket surrounding the bottom. One observer's time was practically entirely devoted to keeping these temperatures constant.

Samples of gas were collected at both the inlet and the outlet of the machine. A glass tube filled with asbestos fibre passed through a cork in a T-piece on the gas-supply pipe at the inlet of the machine, and was connected through a bulbed tube filled with picric and acetic acids to a cubic foot aspirator; all the gas passing out of the machine through a similar asbestos tube

* Mr. Barnes is the holder of the Michigan Gas Association's Fellowship in Gas Engineering at the Michigan University for 1905-6.

† See "Journal," Vol. LXXXVIII., pp. 262, 323; and Vol. XCII., pp. 388, 466.

and absorption train to an aspirator. The asbestos tubes were almost wholly within the constant temperature jacket of the machine, only their tips extending through holes in the wall and connecting to the absorption apparatus. By this plan the tar was filtered from the gas at the inlet in just the same way as in our previous tests; but the centrifugal machine having removed 95 per cent. of the tar, and only a trifling amount remaining to be filtered out by the asbestos tube on the outlet, the result at this point should be free from the reproach that we are scrubbing the gas with the separated tar.

TABLE I.—*Tests at the Ann Arbor Gas-Works.*

Description of Tests.	Temp. Deg. Fahr.	Weights in Grammes per Cubic Foot of Gas.				
		Tar and Water.	Non-Volatile Tar.	Naphthalene.		
				In Tar.	In Gas.	Total.
Test 17 (29/3/06).						
Inlet P. & A. . . .	105	1·503	0 329	0·030	0·031	0·061
Outlet centrifugal .	107	0·202	0·006	0·003	0·011	0·014
,, P. & A. . .	..	0·771	0·050	0·007	0·011	0·018
Test 18 (29/3/06).						
Inlet P. & A. . . .	112	1·725	0·363	0·031	0·032	0·063
Outlet centrifugal .	114	0·456	0·012	0·002	0·015	0·017
,, P. & A. . .	..	0·788	0·049	0·004	0·021	0·025
Test 19 *(29/3/06).						
Inlet P. & A. . . .	113–115	1·274	0·446	0·038	0 031	0·069
Outlet centrifugal .	113–115	0·287	0·021	0·006	0·017	0·023
,, P. & A. . .	..	0·751	0·068	0·005	0·022	0·027
Test 20 *(30/3/06).						
Inlet P. & A. . . .	122	1·774	0·505	0·042	0·045	0 087
Outlet centrifugal .	123	0·376	0·018	0·003	0·028	0·031
,, P. & A. . .	..	0·769	0·091	0·002	0·030	0·032

* Primary condenser bye-passed.

TABLE II.—*Tests at the Saginaw Gas-Works.*

Description of Tests.	Temp. Deg. Fahr.	Weights in Grammes per Cubic Foot of Gas.				
		Tar and Water.	Non-Volatile Tar.	Naphthalene.		
				In Tar.	In Gas.	Total.
Test 29 (24/5/06).						
Inlet P. & A. . . .	142	1·720	0·321	0·029	0·032	0·061
Outlet centrifugal .	142	0 680	0·059	0·003	0·011	0·014
,, P. & A. . .	139	0·891	0·112	0·005	0·020	0·025
Test 30 (24/5/06).						
Inlet P. & A. . . .	136	1·286	0·274	0·026	0·034	0·060
Outlet centrifugal .	136	0·273	0·058	0·002	0·020	0·022
,, P. & A. . .	134	1·045	0·098	0·004	0·019	0·023
Test 31* (24/5/06).						
Inlet P. & A. . . .	136	0·860	0·198	0·013	0·028	0·041
Outlet centrifugal .	136	0·326	0·123	0·003	0·016	0·019
,, P. & A. . .	134	1·121	0·126	0·005	0·023	0·028
Test 32* (24/5/06).						
Inlet P. & A. . . .	140	1·639	0·221	0·017	0·028	0·045
Outlet centrifugal .	140	0·457	0·134	0·004	0·024	0·028
,, P. & A. . .	138	0·812	0 093	0·004	0·018	0·022

* Centrifugal running very slow.

TABLE III.—*Tests at the Detroit Gas-Works.*

Description of Tests.	Temp. Deg. Fahr.	Weights in Grammes per Cubic Foot of Gas.				
		Tar and Water.	Non. Volatile Tar.	Naphthalene.		
				In Tar.	In Gas.	Total.
Test 25 (25/4/06).						
Inlet P. & A. . . .	..	2·261	0·435	0·038	0·055	0·093
Outlet centrifugal. .	136	0·785	0·130	0 005	0·029	0·034
,, P. & A. . .	138	?	?	?	0·032	?
Test 26 (26/4/06).						
Inlet P. & A. . . .	..	1·634	0·385	0·041	0·025	0·066
Outlet centrifugal. .	117	0·480	0·040	0·004	0·018	0·022
,, P. & A. . .	118	1·955	0·149	0·045	0·011	0·056
Test 27 (27/4/06).						
Inlet P. & A. . . .	..	1·607	0·379	0·037	0·026	0·063
Outlet centrifugal. .	116	0·218	0·046	0 004	0·016	0·020
,, P. & A. . .	118	2·242	0·173	0·026	0·029	0·055
Test 28 (27/4/06).						
Inlet P. & A. . . .	..	2·844	0·501	0·041	0·062	0·103
Outlet centrifugal. .	138	1·439	0·056	0·005	0·061	0·066
,, P. & A.. . .	140	2·729	0·182	0·020	0·058	0·078

In carrying out a test, after all connections had been made, the temperature of the machine and connections was brought to that noted at the inlet to the Pelouze separator, and then the experiment was started. It took about 20 minutes to send a cubic foot of gas through the machine. It was impossible to pass the gas much faster and throw out the tar to a sufficient degree; and a higher speed also caused difficulty in absorbing the naphthalene by the picric acid. On the other hand, a slower speed was undesirable, because of the difficulty of keeping the machine at a constant temperature for a long time. In all these tests, a sample was also simultaneously drawn from the outlet of the Pelouze and Audouin separator, so as to have a comparison of the efficiency of the two types of tar-removers, and at the same time obtain an estimate of the probable error involved in the method of sampling employed previous to the adoption of the centrifugal machine.

Taking the results of the first test (No. 17), we see that the quantity of suspended tar and water removed by the asbestos tube at the inlet of the centrifugal machine (which equals the amount at the inlet of the Pelouze separator) is 1·503 gramme per cubic foot; while the amount at the outlet of the machine is 0·202 gramme—indicating a removal of 86 per cent. of the suspended tar and water. The suspended tar and water at the outlet of the Pelouze separator was 0·771 gramme. This shows an apparent removal of less than 50 per cent.; but allowance should be made for the fact that in this test at the outlet of the separator the part of the asbestos tube projecting out of the main was somewhat cooler than that in the main, which allowed some water to condense and be separated that was present as vapour while within the main. A better comparison of the two separators may be made on the basis of tar removed. The samples were drawn in the same way, and should be comparable; but the errors attendant upon sampling from a large main—a subject which will be discussed later—makes their absolute accuracy open to question. Another error in the figures which does not affect the comparison much is caused by the volatility of the light oils of the tar. The separated water and tar are weighed together; but when it is sought to differentiate these constituents by drawing warm dry air through the tube, not only the water but the light oil and naphthalene pass off as vapour. It is possible to absorb the water and to freeze out the naphthalene; but the volatile light oils escape, and go to swell the amount reported as water. From laboratory distillations of larger samples of these tars the amount of this light oil thus lost is estimated at from 2 to 5 per cent. of the weight of the tar. The pitch-like constituents of the tar which do not volatalize are reported as "non-volatile tar." The term is used instead of the "anhydrous tar" of our previous report, and differs from it in that the anhydrous tar included the naphthalene, which is not included in non-volatile tar.

As was stated above, however, the tests of tar removed by the centrifugal machine and the Pelouze separator should be fairly comparable. Comparing these figures, we find the amount of non-volatile tar at the inlet to be 0·329 gramme, while at the outlet of the centrifugal machine it is 0·006 gramme, and at the outlet to the Pelouze 0·050 gramme. On a percentage basis, this corresponds to a removal of 98 per cent. of the tar by the centrifugal and 84 per cent. by the Pelouze separator. The weight of naphthalene in this tar was 0·030 gramme for the inlet and 0·003 for the outlet of the centrifugal, and 0·007 for the outlet of the Pelouze. The amount of naphthalene in the gas passing the asbestos filters was 0·031 gramme for the inlet and 0·011 gramme for the outlet of the centrifugal, with the same amount at the outlet of the Pelouze. This absolute agreement is merely a coincidence; but it is in accordance with the general trend of the results of the series. The centrifugal machine removed a much larger proportion of the tar than the Pelouze; but the amount of naphthalene remaining in the gas was relatively the same in both cases. It is hard to see how there can be any very great error in the quantity of naphthalene in the gas at the outlet of the centrifugal. Even adding the whole of the naphthalene in the tar at that outlet, and charging it to the gas, only increases the amount in the gas from 0·011 to 0·014 gramme. The fact that the two independent methods for naphthalene in the gas give concordant results indicates the correctness of both methods, and that the tests reported last year at the outlet of the Pelouze separator gave reliable results of existing conditions. The amount of naphthalene in the gas at that point is greater than was reported a year ago; but as the quantity of gas coming to the Pelouze separator on the day of the present test at Ann Arbor was over 50 per cent. more than when the preceding test was made, it may offer an explanation of the difference.

Effect of Raising the Temperature at the Inlet to the Pelouze Separator.—The conditions at the inlet of the Pelouze separator and the changes taking place in that apparatus are of interest, and will be discussed later; but at present we desire to restrict ourselves to a discussion of the effect of change in the temperature at the inlet as affecting the removal of naphthalene by the centrifugal machine and the Pelouze separator at the Ann Arbor Gas-Works. Test 18 was made in the same way as the one just discussed; but the temperature of the primary condenser outlet was raised from 105° to 112° Fahr. by closing the draughts. This was as high a temperature as could be obtained in this way; and to get one still higher, the primary condenser was bye-passed altogether. Test 19 was taken at once, before the temperature at the inlet to the Pelouze had risen much, to note the change caused by the more rapid arrival of the gas at the separator. Test 20, at 122° Fahr., was made at the highest temperature which

could be obtained with the primary condenser bye-passed. The full data of the tests are given in Table I. They show an increase of tar coming to the separators with increased temperature; but a practically constant percentage of the non-volatile tar removed independent of changes in temperature. The amount of naphthalene remaining in the gas as it leaves the separators is given in the following table:—

TABLE Ia.

Test No.	Temp. at Inlet of Machine. Deg. Fahr.	Grammes of Naphthalene per Cubic Foot of Gas. At Inlet of Centrifugal.	At Outlet of Centrifugal.	At Outlet of P. & A.	Saturation Temp. at Outlet of Centrifugal. Deg Fahr.
17	106	0·031	0·011	0·011	64
18	116	0·032	0·013	0·021	70
19	115*	0·031	0·017	0·022	72
20	123*	0·045	0·028	0·030	81

* Primary condenser bye-passed.

The series shows a very uniform increase in the amount of naphthalene remaining in the gas at the outlet of the separators with increasing temperature, and indicates a much closer agreement between the results obtained by the centrifugal and by the Pelouze than might have been expected. The percentage variations are in two cases considerable; but the actual amounts involved are so small that very slight errors cause large percentage differences. Although the centrifugal was removing 97 per cent. of the tar, as compared with 83 per cent. removed by the Pelouze, the two machines did not seem to differ much in the way they allowed the naphthalene to go forward in the gas.

In considering the changes which are apparently taking place in the centrifugal, it must be borne in mind that there is a possibility of error at the inlet due to scrubbing the gas with the separated tar. The figures at the outlet are believed to be nearly correct. If there is appreciable error at the inlet, will the reported values for naphthalene in the gas be too high or too low? It is apparent that the only effect of this scrubbing will be to tend to bring about equilibrium in case it does not already exist. If the results at the inlet are too high, it can only be because the tar is giving back to the gas naphthalene which it had previously abstracted at a higher temperature. This is a possibility, but does not seem a probability under the circumstances which prevail here. If, on the other hand, the results at the inlet are too low, it but increases the amount of naphthalene removal to be credited to the machine. With this understanding, the results are presented below.

TABLE IIa.

Test No.	Temperature. Deg. Fahr.	Naphthalene in Gas. At Inlet of Centrifugal.	At Outlet of Centrifugal.	Per Cent. Removed while Passing through Machine.
17	105	0·031	0·011	64
18	116	0·032	0·015	53
19	115*	0·031	0·017	45
50	123*	0·045	0·028	37

* Primary condenser bye-passed.

The centrifugal was, without any drop in temperature, apparently removing from the gas an amount of naphthalene varying from 64 per cent. at 106° Fahr. to 37 per cent. at 123° Fahr., in which latter case it should be noted that the primary condenser was bye-passed. Results at Detroit and Saginaw show a similar drop in passing the machine, although they do not show such close agreement with change in temperature.

(*To be continued.*)

A REINFORCED CONCRETE GASHOLDER TANK.

A recent number of "Engineering News" contained the following interesting particulars in regard to the construction of a reinforced concrete gasholder tank at Dubuque (Iowa).

A gasholder tank of reinforced concrete, 84 feet in diameter and 21 ft. 5 in. deep, was constructed about a year ago for the Key City Gas Company, of Dubuque. This tank, while not remarkable in point of size when compared with other examples of circular-tank construction (including storage reservoirs and gasholder tanks) in the same material, affords a good example of a carefully-planned method of work in erection.

The general construction of the tank is indicated by fig. 1. The bottom is 5 feet below the average grade of the site. The floor is normally 16 inches thick, and rests on piles spaced about 4 ft. 6 in. on centres; but under the wall it is 28 inches thick, and the pile spacing is reduced to 2 ft. 6 in. The floor rests directly on the piles (although a foundation of cinders and sand well mixed and tamped was put in between the pile-heads), and is reinforced only around the edges and under the centre pier. Below the floor are two reinforced concrete tunnels for the inlet and outlet pipes. The wall is 21 feet high, 18 inches thick at the floor-line, and 12 inches thick under the cornice. The centre pier is made of reinforced concrete as indicated in fig. 1. For the floor a 1 — 2·5 — 5 limestone concrete was used; the stone all passed a 2-inch ring, and had the dust removed. This mixture was also used for the cornice. The concrete for the walls was a 1 — 2 — 4 limestone mixture; the stone all passed a 1-inch ring, and had the dust removed. The size and location of the reinforcing bars are clearly indicated in fig. 1. The reinforcement is all corrugated bars. The circumferential bars were spliced by lapping. They were placed in lengths two bays long, the inside bars so as to lap alternately at the pilasters and the middle of the bays, and the outside bars so as to lap alternately at the piers and the middle of the bays.

The general plan of construction was to put in the floor complete, leaving in it a groove or trench to take the bottom of the wall, moulding in the floor also supports for the frames of the wall moulds, as the soft foundation material made it undesirable to rest the frames on the ground; and then to build the wall between forms which could be moved up as the work progressed, the complete circle of the tank being filled to the height of the form in one operation, thus making all joints in the work horizontal. The back-fill around the lower part of the wall was relied upon in the design as a support for the wall; and it was therefore carefully tamped in after the wall was completed.

Floor Construction.—The first work in constructing the floor was to drive the piles in the bottom of the excavation, and then to place the bed of sand and cinders. This being done, two circumferential rows of posts were driven round the outer edge of the foundation bed. The posts were located on the same radii as the wall buttresses. The upper portions of the posts were boxed round, so that, in placing the concrete for the floor, recesses would be left round the tops of the posts, which would enable them to be cut off below the floor level and covered by filling the recesses. The purpose of these posts was primarily to carry the frame bents on which the inside wall forms were carried progressively upward. The lower half of each post was notched, so as to form a bond with the floor concrete, whereby the load of the mould frames would all be carried by the latter. Incidentally, the posts carried the forms for the circular grooves or trench in which the wall was seated.

To the tops of each pair of posts, radially to the tanks, were nailed two planks with ends projecting beyond the outer edge of the floor. To the projecting ends of these planks were fastened cleats extending downwards, and on to these cleats were bent two lines of 1 in. by 6 in. boards, forming a circular bottomless trough round the tank space as the line of the wall. Small strips of board were then nailed across the top of the trough on equidistant radial lines, and from these were suspended two lines of vertical wall-bars. The trench forms being in place, concreting was begun. The concrete was put in in sections; forms being provided for stopping off the day's work. These forms served the double purpose of making a mortise-and-tenon joint between each successive day's work, by setting the tops of the forms to an exact grade of templets between which the concrete could be floated level with straight edges. The object of the mortise-and-tenon joints was both to ensure water-tightness and to give a continuous beam action; the forms being so placed as to subdivide the floor into diamond-shaped panels. The concrete was handled from the mixer to the work in wheelbarrows. When placed, it was thoroughly tamped, roughly floated to the surface, and finally given a trowel finish.

Wall Construction.—As seen in fig. 1, [p. 184] the wall is buttressed on the outside by alternate "pilasters" and "piers." The piers support the columns for the guide-frame, while the pilasters intermediate between the piers support the cornice, and break the outline of the tank, giving a more pleasing appearance.

The wall was constructed as follows: After the floor was completed, the posts driven into the bottom, as before noted, were cut off level 6 inches above the floor, and a bent for the wall form was erected on each radial pair. The construction of these bents is shown in fig. 2. Each bent was raised by hand, and was carefully plumbed and centred; the proper angular distance between the bents was assured by setting each bent on a line from the centre of the tank to a previously set point on the periphery of the floor. The bents were braced together round the tank as shown in fig. 3. The pilaster and pier forms were next set in place directly in front of the bents, and braced in position. A pilaster form in position is shown in fig. 2. These forms were boarded up completely on the two sides; but the rear face boards were placed only after concreting was begun and as the concrete was laid.

To mould the panels between the pilasters and piers and the corresponding spaces on the inside of the wall, curved sectional forms or shutters were inserted between, and fastened by the edges to the pilaster forms on the outside and to the bents on the inside. The outside shutters were exactly similar, except, of course, that they were concave instead of convex. In operation, the shutters were first set up with their bottoms on the concrete floor. The edges of the inside shutter were bolted to the sides of the wall-posts of the bents; this left between the posts and the edges of the shutters triangular spaces which were closed off by vertical 2-inch strips of steel fastened to 1 inch square strips of wood. The edges of the outside shutters were lag-screwed to the 4 inch square posts of the pilaster forms. The face sides of the shutters were oiled with crude oil when set, and again after the first shift; but it was not found necessary to oil the forms for every move. The forms were 4 feet high, and were raised 3 feet, leaving one foot of the lower part lapping over the finished concrete. The forms were raised by means of blocks hung from a 6 in. by 4 in. timber placed across the top of the adjacent bents and pilaster forms. The forms were shifted the day after placing the concrete. At first it took almost a full day to get the forms for the full circle into their new position; but after two shifts this

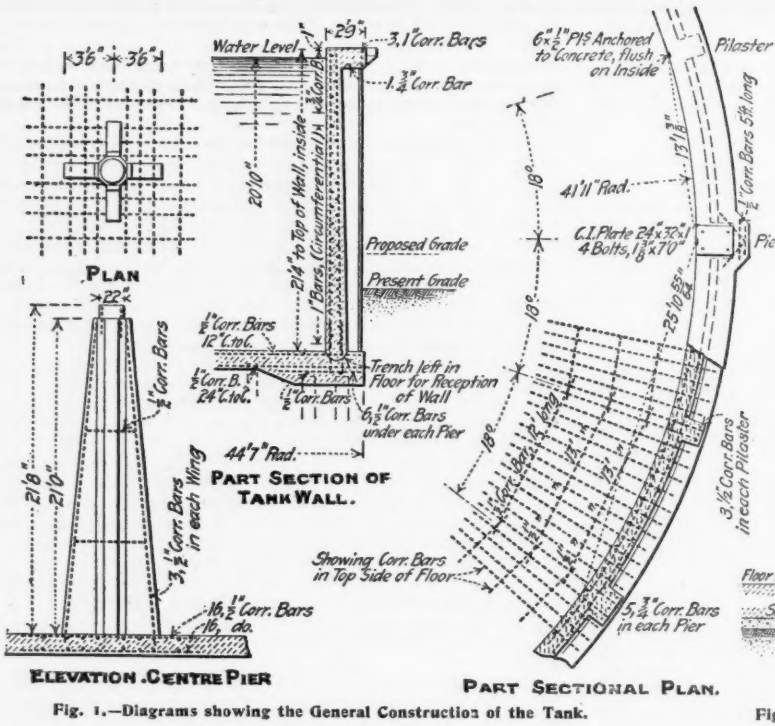


Fig. 1.—Diagrams showing the General Construction of the Tank.

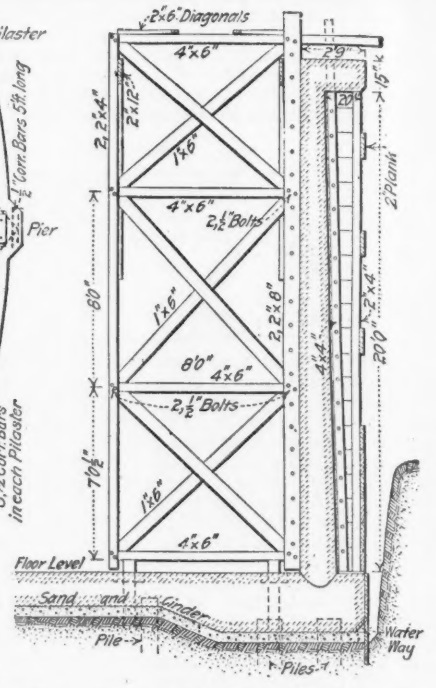


Fig. 2.—Details of Frame for Inside Wall Forms.

time was reduced to half-a-day. Much of the delay was due to the ½-inch bolts tying the inner and outer moulds together at the intermediate verticles (see fig. 3), which bolts became bent, and were very difficult to remove.

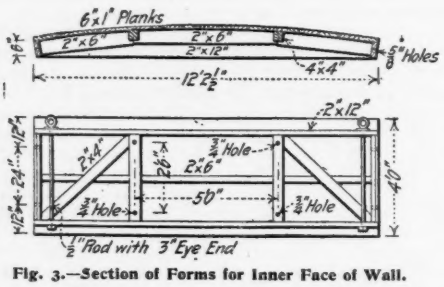


Fig. 3.—Section of Forms for Inner Face of Wall.

The 6 in. by ½ in. vertical steel strips moulded in the inside face of the wall at each pier and pilaster, shown in fig. 1, were used in connection with the mould frames as follows: The plates were bolted to the outside face of the frames, covering the 6-inch space between the two uprights of each frame, being bolted in such position as to bring their inner face flush with the outside of the frame (or the inside of the wall). Anchors fitted to these plates at intervals of 3 feet serve to hold them firmly to the wall. During construction this rigid connection between frame, plate, and wall acted to hold the frame firmly in place, so that the diagonal bracing of each bent could be removed to make room for wheelbarrow runways. The runway on the inside rested first on the second horizontal of the frame, and the concrete was dumped from a platform outside through the bars upon a platform on the runway; thence it was taken by wheelbarrow and dumped into place. The runway was raised to successive horizontals as the work progressed.

Reinforcement.—The sizes and distribution of the reinforcing steel are given in fig. 1. The placing of the floor reinforcement has already been referred to. The wall reinforcement was all placed and wired up before the wall concreting was begun. This work was relatively simple. The bars came in lengths of about 30 feet, and this gave a lap of about 3 feet on the circumferential bars; the laps being located at every second division, as already noted. The lapping ends of the circumferential bars were first loosely hooped with two ties of No. 10 wire; then the verticals were placed, and the circumferential bars were pulled up to their proper levels and wired to the verticals. The lapping was done in such a way as to allow the concrete to surround each bar, as reliance for splicing was placed wholly on the concrete.

Some Cost Items.—The cost of unloading the reinforcing steel from the cars and placing it in the structure was $7 (29s. 2d.) per ton. The labour of mixing and placing the concrete amounted to 3·4 hours per cubic yard for the floor, 5·2 hours per cubic yard for the wall (including pilasters and piers), and 5·4 hours per cubic yard for the cornice. The cost of the forms cannot be expressed so satisfactorily. Generally speaking, and making no allowance for the value of lumber after use, 9 c. per square foot of wall would cover the cost of materials, fabrication, and taking down and putting up the forms.

STOKING MACHINERY FOR CARDIFF GAS-WORKS.

The Directors of the Cardiff Gas Company have had under consideration for some time past the introduction of stoking machinery; and on the advice of their Engineer (Mr. H. Morley, M.Inst.C.E.), they have decided to instal West's compressed air machinery at their Grangetown works. The retort-house, which has recently been extended, contains 35 through benches of eights, and is admirably adapted and designed for the introduction of stoking machinery, in conjunction with which a complete installation of coke conveying and storing machinery is to be introduced. The stoking machinery comprises four separate lines of coal plant, a like number of coal breakers, sets of automatic feeders, elevators, and coal conveyors across the retort-stack, eight coal-storage hoppers with a capacity of 40 tons each, and also two of West's compressed air charging-machines, two drawing-machines, air compressor, &c. The coke-handling machinery comprises four of West's coke conveyors, which deliver the coke at the centre of the retort-house on to a cross conveyor which conveys the coke to the yard.

The installation also provides for a coke-storage scheme which includes coke-hoppers with a capacity of 400 tons, and an overhead gantry and steam crane which will store in the yard 5500 tons. The coke-hoppers will be fitted with screens, and are arranged to fill either carts or railway waggons on a railway siding running parallel with the coke-hoppers. The retort-house conveyor delivers the coke either to coke-skips, which are manipulated by the crane, or to a conveyor over the hoppers. The steam crane will not only store coke in the yard and deliver it to the hoppers, but can also be utilized for picking up the coke from the yard again. Two boilers are included, each 8 ft. 6 in. diameter and 30 feet long, and also four compressed air capstans with a suitable air compressor for operating the railway waggons.

A contract for the complete plant has been placed with West's Gas Improvement Company, Limited, and the machinery is to be proceeded with at once, and put into operation early next summer.

Gas-Pipes on Railway Tracks.—Laying pipe-lines on a railroad right-of-way to avoid excessive franchise taxation in cities, has been resorted to by the Everett (Mass.) Gas Company. A franchise tax of $6000 per annum would have been imposed by the city upon new mains which the Company were about to lay, and this was avoided by securing the rights to follow the line of the Saugus branch of the Boston and Maine Railroad from the Company's plant to the points of supply. It is to be noted that an incidental economy was thereby secured, as the cost of constructing the pipe-line on the railroad property was very much less than if it had been laid through city streets as originally intended.

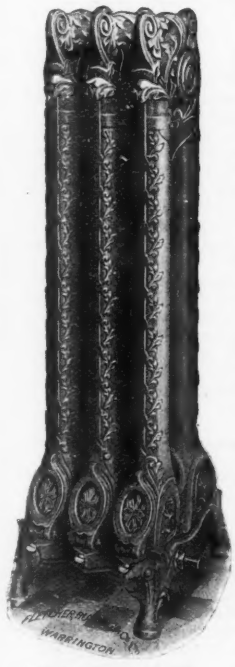
MODERN GAS FIRES AND OTHER HEATERS.

Messrs. Fletcher, Russell, and Co., Limited.

THE name of Messrs. Fletcher, Russell, and Co., Limited, has ever been a guarantee for style, efficiency, and quality in gas fires and stoves and other heating apparatus; and the new season finds them maintaining their reputation. The most dilettante among us could not fail to be captivated by such designs in heating apparatus as that presented by the "Florence" stove, which is particularly suitable for standing in the centre of halls, shops, &c. It has all four sides similarly ornamented, and contains four luminous flame burners with a separate tap to each, so that the heating power is under perfect control, and can be regulated to need. The stove is made throughout of cast iron, and is flueless and non-condensing. Considering the modest amount of space that it demands, and the ease of its installation in all suitable situations, it does excellent work. Over-all it is 17½ inches wide, 43 inches high, and 17½ inches back to front; while the approximate heating power is 400 square feet. It is finished in majolica colours and black.

The "Florence" Stove.

Our second illustration is of the "Ivor" radiator; and here again we have a heater of pretty design. It is flueless and non-condensing, and is on the same principle as the firm's floral pattern, but has the appearance of ordinary water and steam radiators. A luminous flame burner, with tap, is fitted to each column; and with ruby coloured glass to each lighting door, the effect is, when the burners are alight, very pretty indeed. The "Ivor" can be supplied with any number of columns from two upwards. A general idea of the space occupied will be gathered by giving the dimensions for a three-column radiator—viz., 10½ in. wide, 36 in. high, 14½ in. back to front; and the approximate heating power may be taken as 100 square feet of floor area per column.



The "Ivor" Radiator.

In the "Anglia" we get back to the ball fuel fire; and the very neatness of the design is its first attraction. This is a case where "neatness" is not expressive of sombreness; for, though neat, skill has been exercised in producing an external artistic refinement. There is, in effect, a series of these "Anglia" fires, though the distinguishing features are only found in their fitting, to satisfy the customer's fancy, with ball fuel, asbestos fibre, or iron frets. A cast-iron enamelled reflector is attached to the fire, which has also a tubular radiating top—thus combining the advantages of an open gas-fire and a warm-air stove. The lower portion of the back plate, together with the burner and guard, are removable, for cleaning purposes. The sizes of the stoves are 19¼ in. wide, 23¾ in. high, 10½ in. back to front, with a 10-inch fire opening. Finished in majolica enamel colours or majolica enamel black, these fires will make a strong appeal.

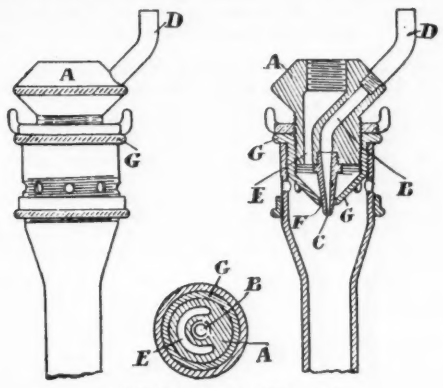
REGISTER OF PATENTS.

Inverted Gas-Burners with High-Pressure Air Supply.

FAIRWEATHER, W. C.; a communication from R. O. KLATTE, of Hamburg.

No. 18,012; Sept. 6, 1905.

The patentee claims as his invention a method of obtaining high-pressure incandescent gaslight with inverted burners and mantles, characterized by the fact that, in addition to the air entering the usual air-admission orifices in the sides of the burner-tube, a supply of air under pressure is delivered to the gas current in one or more fine jets, so as to lead the mixture of gas and air (in spite of its natural tendency to rise) downwardly through the burner, and thus—while avoiding the reversing of the flame in a short arc and the striking-back of the burner—a downwardly directed long extended flame cone is produced beneath the burner, and "a light of great illuminating power and economy is produced."



Klatte's Inverted Gas-Burner.

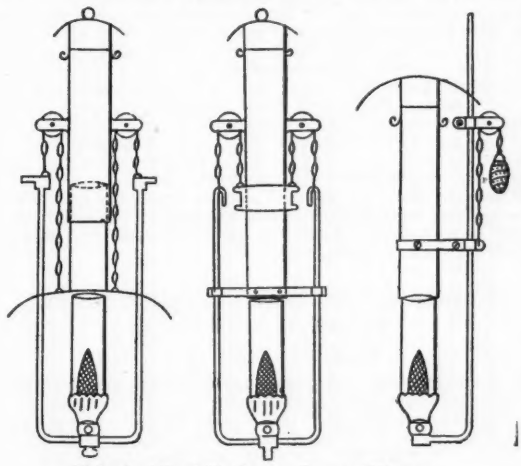
In the arrangement shown, the connection A from the gas-pipe is provided with a passage B, to the lower open end of which is screwed a nipple C. Connected to the upper end of B is the compressed-air pipe D. A passage for the gas is formed by a semi-circular slot E surrounding the passage B. An internally-threaded sleeve G, having an orifice F, is screwed on the externally threaded end of the part A—the sleeve serving as the controlling nipple for the gas supply. While in the highest position of the sleeve G, the opening F is fully closed by the nipple C, and at the lowest position is full open; so that, by adjusting the sleeve or the nipple, the gas supply can be regulated according to requirements. On an externally threaded part of the sleeve is screwed the burner-tube or mixing-tube carrying the burner-head, The external air enters the mixing-tube through the perforations shown, and can be regulated by a screw-threaded ring.

Intensifying the Light of a Bunsen Burner.

BLAKEY, J. W., of Bradford.

No. 18,305; Sept. 11, 1905.

The patentee proposes to effect his object by using a chimney that will draw in a larger amount of air into the mixing-chamber. To the chimney would be attached a chain passing over a pulley, so arranged that (with a chandelier, for example) as the burners are drawn down the chimneys move upwards immediately over the burners. In a slide pendant, in place of the moving part of gas-fitting being used to move the chimney, balance-weights may be applied to the chimney.



Blakey's Adjustable Bunsen Burner Chimney.

In a distinct application of the invention, the chimney may be suspended by a hook, chain, or the like; and on one part of the chimney is attached a pulley-wheel or pulleys, and to another part of the

chimney—that is, made to slide inside the chimney, with pulleys attached—is a shade or reflector. Over these pulleys is passed a chain; and to one end of the chain is attached the framework for carrying the burner, and to the other the chimney with (or without) reflector, that acts as a balance-weight to the part with the gas or burner fittings attached.

The illustration shows the various forms referred to, and needs no further explanation.

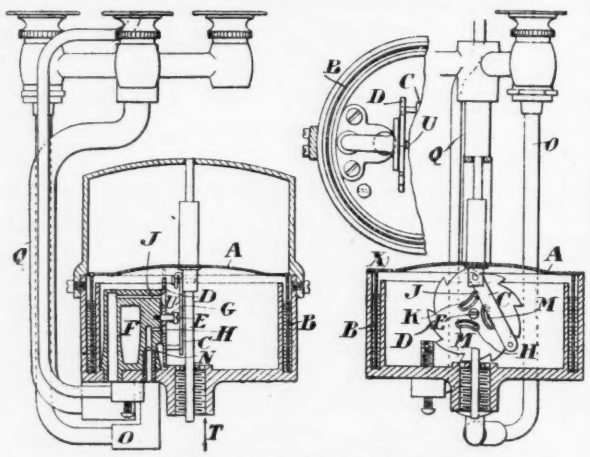
Automatically Lighting and Extinguishing Gas-Lamps.

ANDERSON, J., of Edinburgh.

No. 19,039; Sept. 20, 1905.

This invention relates to rotary disc-valves of the step-by-step type, as described in Leutschat's patent No. 7298 of 1898; the object being to provide a valve, adapted to control the supply of gas to a number of burners in a lamp and also to operate in the same circuit with the step-by-step valves. The valve is provided with holes at different radial distances or obliquely-curved slots, and is adapted to be moved through a recurring cycle of stages whereby, at each stage or step in a cycle, the valve is adapted to cover or uncover a different number of gas passages, for the purpose of extinguishing or lighting the various burners of a group.

In the main thoroughfares and at street crossings, where it is desired to maintain the lamps lighted after those in the less frequented and residential districts are extinguished, the lamps would have three burner heads—all three burning up till midnight, and after that time only one. When it is desired to maintain the corner lamps alight after the ordinary street lights have been extinguished, a valve, such as is shown in the 1898 patent, is used. The three-burner lamps, in which (say) one of the burners only is required after midnight, are provided with an automatic lighting device, having a step-by-step valve in which there are two sets of holes disposed at different radial distances, or short curved slots set non-radially and eccentrically.



Anderson's Automatic Lamp Lighter and Extinguisher.

In the form illustrated, a loaded bell A works in an annular liquid seal B, and has depending from within it a pendulum link C, adapted to engage the teeth of a disc valve D, of the step-by-step type. This valve is pivotally mounted on a pin E, and is pressed resiliently on its seat F by a spring G. The seat is, in the form shown, provided with two openings H and J, at different radial distances from the centre of rotation of the valve. The hole H communicates with a passage N, leading by a pipe O to one of the burners of a three-burner lamp; and the opening J leads, by a pipe Q, to the other two burners.

The operation is as follows: In the position shown, the gas passages to all three burners are open, and gas flows from the inlet T, through the openings in the valve D and the gas-pipes O and Q, to the burners. On sending a momentarily increased gas pressure over the mains, the bell A is raised, carrying with it the link C, which causes the disc D to be moved through the angle of one tooth—that is, 40° in the form illustrated. The part M of the slot thus moves out of register with the opening J, and as the part K is at a smaller radius than the hole J, that opening is closed, while the opening H in the valve face remains uncovered. Gas then passes to one burner, while the other two are extinguished. The next pressure increase causes the closure of the opening H, whereby the first light is extinguished. A further increase causes the valve D to uncover both openings H and J, and so on this cycle of operations is continued.

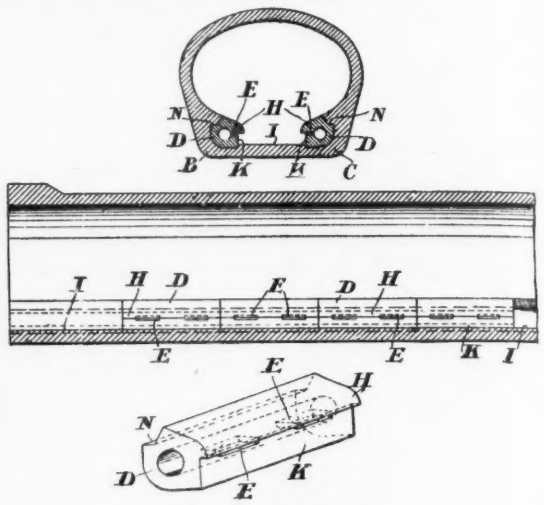
Introducing Steam or Gas into a Retort.

HECKERT, G. A., of Munich.

No. 25,045; Dec. 2, 1905.

In his specification, the patentee points out that, for the purpose of generating water gas, it has been suggested that steam should be introduced into a retort through an iron pipe on the bottom of the retort. As, however, such an iron pipe burns after it has been in use for a short time, it was attempted to construct a steam duct in the wall of the retort, but without success, because the inlets from the duct into the retort were perpetually being stopped up by the coal dust and products of distillation. Then, if steam is not constantly issuing from the inlets—that is to say, if the admission is only periodical—during the intervals of no admission of steam the particles of coal lying in front of or around the inlets are soon converted into graphite and completely cut off the steam-duct from the interior of the retort.

The present invention is said to eliminate all these objections, and also offers the particular advantage that the retort and the steam or gas duct are independent of each other in respect of their life, by arranging the duct as a piece separate from the wall of the retort and not lying within the wall—thus the duct is independent of the retort, and is made of a refractory material like fire-clay.



Heckert's Retort-Duct.

The illustration shows a vertical cross section of a retort having two such ducts, a part longitudinal vertical section of the retort, and a perspective view of one of the sections of refractory material.

The retort has a cross section such that the bottom angles B and C are shaped to receive interchangeable duct sections D, which, when laid end to end, constitute the gas or steam duct. These sections have outlet openings E, affording communication between the passage through the section and the interior of the retort. In order that, during the charging or discharging of the retort, particles of coal or coke may not enter the openings and stop them up, the latter are inclined, preferably at a sharp angle, towards the bottom of the retort. Moreover, in the form illustrated, the openings are beneath a projecting part H, whereby, when the retort is being filled, the openings are not choked.

The cross section of the duct section D is such that it fits the inner contour of the angles and the bottom of the retort. On the bottom is a longitudinal rib I, against which the lower edge of the vertical side K of the section rests. Overhanging the bottom angles of the retort are longitudinal ribs on the sides of the retort, with which a correspondingly shaped longitudinal shoulder N on the upper part of the section engages when the section is pushed into the retort from the front. In this way tipping forward or lateral shift of the section is prevented.

Flash-Light Advertising by Gas.

MAURIN, L., of Paris.

No. 27,146; Dec. 29, 1905. Date claimed under International Convention, Jan. 4, 1905.

This invention has for object an automatic apparatus for the lighting by gas of luminous advertisements—characterized by the disposal of a wheel worked by the gas, which puts in motion a cylinder provided with keys coming to raise, at certain determined moments, some pipes carrying the gas. The open end of these pipes drops into liquid so as to make a hermetical closing. When one of the pipes is raised by one of the keys, the open end comes above the liquid and the gas enters it, to go through it to the burner (or burners) placed behind the sign, where it lights up from the contact of another bye-pass burner into which the gas flows continuously. When the key leaves the raised pipe, this one drops back, and the open end, by falling into the liquid, stops the arrival of the gas to the burner, and the light is then suddenly put out. The apparatus can be arranged to produce the lighting up and putting out alternately, and all the letters of a word at a time, of a full word or sentence, or it can spell the same word, or sentence, one letter after the other. In the last case, the putting out of the light is produced only after the last letter has been lighted up.

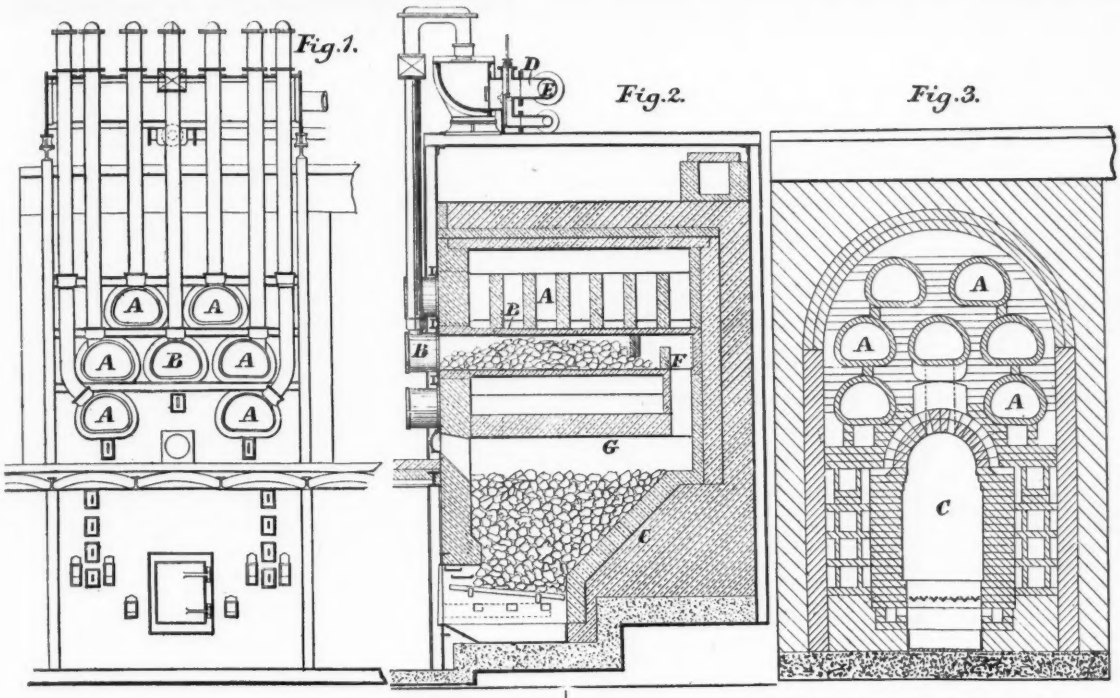
Blending Producer and Coal Gas.

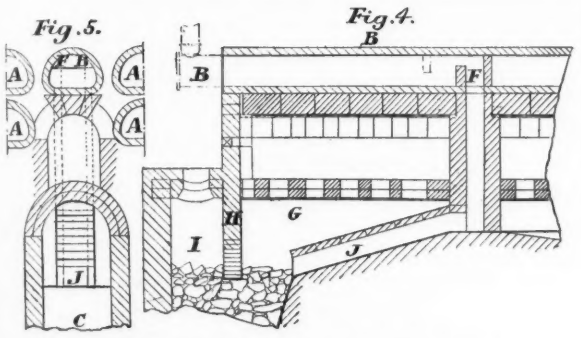
SHADBOLT, R. G., of Grantham, and TULLY, C. B., of New Southgate, N.

No. 21,124; Oct. 18, 1905.

This is a modification of patent No. 16,955, of 1905—see "JOURNAL," Sept. 18, p. 776.

The present patentees' proposal is to pass the producer gas, before being blended with the coal gas (as described in the earlier specification), through a body of incandescent coke or carbon, placed in a conduit or additional retort (called, for distinction, the "reducing" retort) set horizontally, diagonally, or vertically in the combustion chamber for this purpose, in one of the existing benches of retorts altered to provide for the operation, or in some other position where a suitable temperature can be obtained. The producer gas may be introduced at the back of the reducing retort and be taken off at the mouthpiece end, and conveyed by a pipe to the hydraulic main or any other suitable





Shadbolt and Tully's Apparatus for Blending Gases.

part of the gas plant. The pipe conveying the gas from the reducing retort is covered with fire-clay or equivalent material so as to maintain the heat of the gas until it is blended with the coal gas.

Fig. 1 is a front elevation, fig. 2 a cross section, and fig. 3 a vertical section showing a known arrangement of gas-making apparatus modified to enable the present invention to be carried into practice.

A are gas-making retorts arranged in brickwork above a regenerative furnace comprising a gas-producer C, gas from which is burnt to heat the retorts. The resulting coal gas is led in the usual way to the ascension pipes and hydraulic main, whence it passes through an outlet pipe D to a foul main E. One of the retorts—namely, the central one B (the reducing retort)—is charged with coke, and is formed at its rear end with an inlet opening F connected by a vertical passage in the brickwork with the rear end of the gas-chamber C of the gas-producer at a short distance above the level of the fuel therein. The front end of the reducing retort B is connected by its cover and ascension pipe to the hydraulic main like the coal-retorts. Its rear end is provided with upwardly and downwardly projecting walls that serve to form a passage through which the producer gas entering the retort will be caused to flow through the mass of coke therein instead of over the top.

By the arrangement described, when the gas-making plant is in action, the reducing retort B, and the coke therein, will be raised to a state of incandescence; and some of the gas generated in the producer C will, in consequence of the suction set up in the hydraulic main, be caused to pass to the inlet F of the retort, and thence be caused to flow through the incandescent mass of coke therein. It will thence flow through the ascension pipe to the hydraulic main, wherein it will become blended with the coal gas entering the main through the ascension pipes from the ordinary coal-retorts.

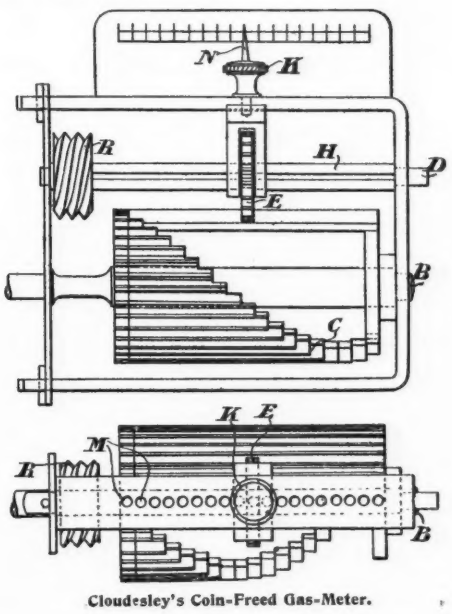
By causing the producer gas that is to be blended with the coal gas to pass through the incandescent mass of coke in the reducing retort B, the carbon dioxide in the producer gas will, to a large extent, be converted into carbon monoxide; so that the heating and illuminating value of the producer gas, and of the resulting blended producer gas and coal gas, will be enhanced.

Fig. 4 is a longitudinal section, and fig. 5 a cross section showing part of a modified arrangement of producer and special retort. Here the upper part of the gas-producer is provided with a depending wall H that separates the gas-chamber G from the fuel-charging chamber I. The vertical draw-off gas-passage, for conducting producer gas into the rear end of the reducing retort B, is placed in communication with the chamber G at a point above the fuel in the producer through an inclined passage J that is formed by and between the side walls and the top and bottom walls respectively.

Coin-Freed Gas-Meters.

CLOUDESLEY, J. L., JUN., of Reigate.
No. 26,190; Dec. 15, 1905.

The object of this invention is to provide means for adapting the mechanism to suit variations in the price of gas; and it relates more specifically to mechanism for permitting variations in the quantity of gas delivered for a given coin—such mechanism being interposed between the coin-receiving mechanism and the delivery mechanism, which are of any well-known types.



Cloudesley's Coin-Freed Gas-Meter.

In the frame mount shown is a shaft B, carrying a spirally mutilated spur wheel C of considerable length; and on a spindle D, arranged parallel to it, is mounted a pinion E, adapted to engage with the mutilated wheel. This pinion is about equal in breadth to each of the steps of the mutilated wheel, and although free to slide on its spindle, it remains in driving engagement therewith by means of a feather and feather-way H. The first operative element of the mutilated wheel is complete—*i.e.*, no teeth are omitted; the second element has at least two teeth omitted, so as to provide a period during which the mutilated wheel and the pinion I are out of engagement; while succeeding elements preferably decrease regularly by one tooth at a time, as shown in the figures. The position of the sliding pinion in relation to the mutilated wheel may be determined by a fork I embracing the pinion, and adapted to be slid into any required position and there clamped by the knurled thumb-screw K, passing through one of a series of suitably pitched holes M in the frame. In connection with the fork there is mounted an index finger N, with a scale to indicate the setting of the gear—*i.e.*, the number of cubic feet of gas which the meter will deliver for one coin.

The action of the invention is as follows: On inserting a coin into

the coin-receiving mechanism (which may be of any suitable type, and is not shown in the engraving, since it forms no part of the invention), the shaft B is actuated and a revolution given to the mutilated spur wheel. The pinion E is thereby rotated to an amount depending on the part of the mutilated wheel with which it engages; and by means of suitable gearing (which likewise forms no part of the present invention, but preferably includes, as a precautionary measure, a non-reversible element, such as the worm R, attached to the spindle D) a gas-valve is opened to a predetermined amount, and the meter is thus set to deliver a predetermined quantity of gas.

It will be seen that, during part of the revolution of the mutilated wheel, the motion of the pinion E is no longer positively constrained. If the coin-receiving mechanism is sharply operated, a possibility exists of the pinion running on by its own momentum, and eventually causing more gas to be delivered than has been paid for, In most cases the resistance of the meter mechanism itself is, however, sufficient to prevent such over-running; but, when desirable, a suitable drag (which might consist, for example, of the friction of a spring) could be provided on the spindle D, and thus ensure the proper working of the mechanism in all cases.

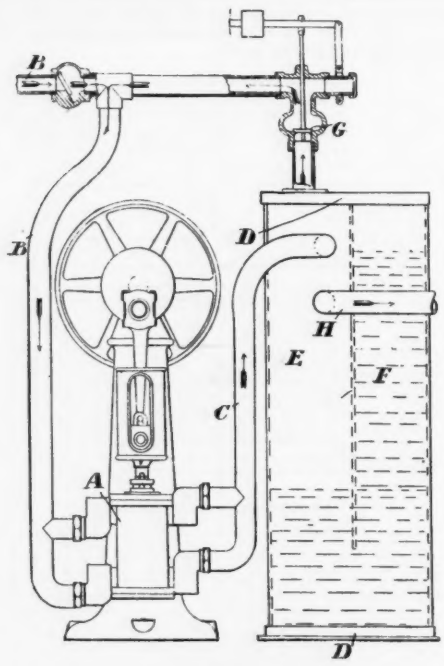
Increasing Pressure in Gas Distribution.

KAUFMANN, C., of Berlin.

No. 27,167; Dec. 29, 1905.

This apparatus for increasing pressure in gas distribution comprises a vessel with intercommunicating compartments, into one of which the gas is forced, while the other contains water controlling a device for relieving the pressure when it exceeds the pre-determined amount. The compartment vessel is obtained by two cylinders of different diameters (working telescopically) and a float-operated valve. This device, in some constructions, is adapted to stop the gas supply, and in others to permit the gas to return to the supply pipe; and it is to the latter form of apparatus that the invention is specially directed.

It comprises a vessel divided by a vertical partition into two compartments communicating with each other at the bottom and containing water; a pump or equivalent device for delivering gas to the vessel; a pipe or pipes establishing communication between the top of the latter and the pump; and either a valve controlling the pipe or pipes and cpened directly by the gas in the vessel, or by the water therein, through the medium of a float, or else two valves, one of which is opened directly by the gas in the vessel, and the other by the contained water and a float actuated thereby.



Kaufmann's Gas Pressure Increaser.

In the construction represented, there is a double-acting pump A, whose suction and delivery sides are connected by pipes B and C to the gas-supply pipe and a vessel D, divided by a vertical partition into two compartments E and F, communicating with each other at the bottom of the vessel. The vessel is partly filled with water; and the gas is forced into one compartment, thereby causing the water to rise in the other. The pressure in E is under the control of a valve G in a pipe connected at one end to the compartment and at the other to the suction pipe B. The valve is, of course, adjusted to give the required pressure to the gas, which flows to any desired place through a pipe H connecting with compartment E.

In operation, as the gas is forced into this compartment the water is forced from it into compartment F until the required pressure is obtained; the level in the latter compartment rising correspondingly. If the pressure rises beyond that desired—due to the outflow of gas for use being decreased—then the valve G opens under the direct influence of the gas, and the surplus flows back to the suction side of the pump A through the intervening pipes, to be again forced into the compartment E. Thus the necessary balance of pressure is obtained.

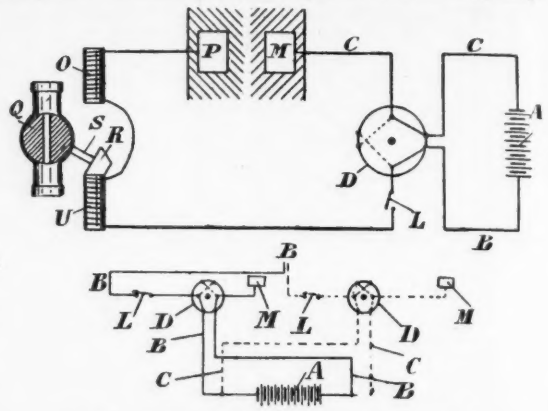
Lighting and Extinguishing Street Gas-Lamps.

WEBER, M., of Homberg, Germany.

No. 3744; Feb. 15, 1906.

This arrangement is one by which street gas-lamps can all be lit or extinguished simultaneously or separately from a central station.

Leading from the source of current A are the two main conducting wires B and C to a reversing switch D having six terminals. From here the conducting wire B leads to the switch L, and from there into the street; whereas the conducting wire C leads from the reversing switch D to the earth-plate M. When the wires B and C reach the vicinity of a lamp, the latter is connected, and the current passes through the electro magnets N and O to the earth circuit through the earth-plate P—in this way forming a special circuit for every lamp.



Weber's Street Gas-Lamp Lighter and Extinguisher.

Placed between the two electro magnets N and O is a tap Q, which carries a lever S, furnished with a magnet R. When the circuit is closed by the switch L, the current passes through the electro magnets N and O; and the tap Q is consequently either closed or opened as similar poles repel and dissimilar poles attract each other. Should the current be reversed by the switch D, the poles then change; and the pole having hitherto attracted the tap will now repel, or *vice versâ*.

APPLICATIONS FOR LETTERS PATENT.

21,130.—SCHÖNE, L., "Gas heating-ovens." Sept. 24.

21,148.—SENSENSCHMIDT, M., "High-pressure burner." Sept. 24.

21,158.—WOUWERMANS, P. VON, and the GASSPAR-UNTERNEHMUNG NACH SYSTEM WOUWERMANS, HALBMAYR, AND CO., "Bunsen burners." Sept. 24.

21,168.—STILL, W. M., and ADAMS, A. G., "Incandescent gas-lamps." Sept. 24.

21,236.—BURY, J., "Inverted burners." Sept. 25.

21,247.—JACOBSEN, J., "Gas lighting and extinguishing apparatus." Sept. 25.

21,254.—BORNEY, O. L., and the DIESEL ENGINE COMPANY, LTD., "Internal combustion engines." Sept. 25.

21,258.—DOWSON, J. E., "Producer gas-generators." Sept. 25.

21,269.—KOPPERS, H., "Eliminating without danger the combustible but low-grade gases of dry distillation or gasification." Sept. 25.

21,280.—ELLIOTT, M., "Bunsen burner." Sept. 26.

21,286.—DALE, I. H., "Shades for gas." Sept. 26.

21,300.—THOMAS, W., and MILNE, J., "Apparatus for indicating the pressure of gas, air, or the like fluids." Sept. 26.

21,320.—JOHNSON, A. F. J., "Production of acetylene gas." Sept. 26.

21,322.—WICKHAM, W. F., and DAVIS, J. G., "Portable gas-cooker." Sept. 26.

21,408.—WARBURTON, W., "Incandescent burners." Sept. 27.

21,446.—HOWARD, R. L. & E., LLOYD, R. S., HOWARD, H. F. & F. E., and GIBBINS, G. M., "Meters for water and other liquids." Sept. 27.

21,521.—BARTLETT, F. G., "Lighting and extinguishing gas-burners at a distance." Sept. 29.

21,556.—HUTCHINS, T. W. S., "Gas-producer." Sept. 29.

21,581.—STOTT, J., and SAVILLE, G. E., "Supply of air to gas-purifiers." Sept. 29.

21,647.—DENAYROUZE, L., "Incandescent Lamps." Oct. 1.

21,750.—FROMHOLD, T., and BLESSLEY, V. H., "Gas-cooker." Oct. 2.

21,759.—ABEL, K., "Incandescent burners." Oct. 2.

21,817.—OXMAN, H. J., and LUSON, T. G., "Burners." Oct. 3.

21,847.—AKTIENGESELLSCHAFT FUR SELAS-BELEUCHTUNG, "Producing a constant mixture of gas and air and apparatus therefor." Oct. 3.

21,992.—ANNS, A., "Coal and gas fires." Oct. 5.

22,011.—ALTMAN, J., and the WHOLESALE FITTINGS COMPANY, LTD., "Bye-pass for gas-lamps." Oct. 5.

22,012.—HEYMANN, G., "Igniting and extinguishing gas." Oct. 5.

22,013.—KUPPERS, K., "High-temperature incandescent gas lighting." Oct. 5.

22,017.—WOLFF, L., "Inverted lamps." Oct. 5.

22,028.—HARRIS, L. G., "Compositions for use in the production of gas from garbage." Oct. 5.

22,059.—STUBBS, G., and HALL, E. S., "Distance gas lighting." Oct. 6.

22,068.—MORTON, F. & C., "Arrangement of inverted incandescent gas-burners." Oct. 6.

22,114.—ROESSLER, A. C., "Incandescent lighting." Oct. 6.

22,131.—WALKER, A. B., and DONALDSON, J. H., "Street-lamps." Oct. 6.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by Correspondents.]

Mr. Hardie's Address.—The Tar and Sulphur Questions.

SIR,—In Mr. Hardie's Presidential Address at Newcastle-on-Tyne, reported in last Tuesday's "JOURNAL," there is the following passage about tar: "There are undoubtedly channels for the disposal of tar, other than those for the purpose of distillation; but its usefulness in other directions would unfortunately seem to depend at present on its price being at rock-bottom, and consequently the benefits accruing are practically *nil*. How we are to take advantage of the consumers of the smaller quantities to raise the selling price to the larger consumer, and still to keep the price low to the former, is a question which I leave to our commercial men to determine."

I thought all gas men knew that the supply of tar products exceeds the demand, with the inevitable result that the German makers of dyes and innumerable other valuable and now necessary things obtainable from tar can buy all they want at their own prices. They accumulate very large stocks of tar products, such, for instance, as anthracene, of which I am informed they hold stock sufficient for five years; and this product of the tar-still, which at one time was sold at 4s. or more a unit, is now quoted at 1½d. If the supply were not more than equal to the demand, the price might well be 2s. or more per unit. This alone would easily give an extra penny per gallon on the price of tar, and would take a penny off the price of gas. Tar distillers have to sell their products at anything the buyers please to give—very much less than they can afford. This accounts for "rock-bottom" prices—about the value of tar for fuel. If coal were distilled for its tar, the market would not be glutted; but being a bye-product, over-production cannot be prevented.

Of course, this is extremely elementary. What is the remedy? If for the last ten or fifteen years half our tar had been used as fuel, or thrown into the sea, or buried in the earth, we should to-day be in receipt of a far greater revenue from tar than is now the case. Let us therefore encourage, by all means in our power, the use of tar for road making. Happily it is rapidly becoming recognized that to obtain that great *desideratum*, dustless roads, tar is the thing. Anyone can see that if (say) half the tar made were sold for other purposes than distilling, such as road making, thus reducing the products of distillation to a quantity not in excess of the demand, a very good price would be obtained for the other half. For the half sold for road making and repairing, or for fuel, we should certainly get as good a price as we now obtain from the distillers—probably rather more; and with this we might well be content.

I am sorry Mr. Hardie, when mentioning the repeal of the sulphur restrictions, which he says "has been a great relief to the management" of his Company, did not say a word for that very useful, but inadequately supported, body the Gas Companies' Protection Association, through whose instrumentality the Bill was promoted and the Act passed which freed some fourteen or fifteen companies from those restrictions. In this connection, however, I must say that much was due to the co-operation of the Newcastle Gas Company, so ably represented in the matter by their Engineer, Mr. Doig Gibb. I hope the Gas Companies' Protection Association will complete that good work next year by doing the same for the score or so of gas companies still under these restrictions; and let us also hope that all those companies will have the wisdom to seize the opportunity of getting the relief at a minimum of expense, which will certainly be saved in the first year.

Oct. 12, 1906. GEORGE LIVESEY.

Nottingham Gas Troubles.

SIR,—Some few months ago, you were so good as to grant me space in your excellent "JOURNAL" for some remarks upon this matter, in reply to an editorial of your own; and I then passed severe strictures upon Mr. Brown, fully believing that they were justified—that the accusations alleged against him were true. I now find that some of them were not justified; and in face of the unsatisfactory report adopted, I cannot but believe that Mr. Brown is innocent of the remaining charges.

Without being unduly egotistical, I am somewhat of the opinion that sufficient import attaches to my previous letter to possibly render it greatly detrimental to Mr. Brown, and perhaps prejudice him in the eyes of his professional brethren; and therefore I bespeak your insertion of the accompanying portions of letters, sent by me to our most influential local journal, in the hope that by so doing reparation may be made to Mr. Brown for whatever injury I have caused him, and that no stigma shall in the future rest upon him. I may add that it is only after a due conviction of Mr. Brown's innocence of the charges alleged against him, and after witnessing the remarkable benefits obtained by following his advice, that I seek to publish my testimony to Mr. Brown, whose efficiency I now fully believe in, and whose integrity is most high.

Perhaps it would be only right to express my appreciation of the courtesy of Mr. Brown's able Assistant, Mr. A. Docking, who has secured such results with the same fittings, that I am convinced much of the trouble was due to the incompetency of the plumbers. Also, I must testify to the correctness of your editorial, and express regret that my strictures upon you were mistakenly somewhat severe.

Lambert Cottage, Talbot Street,
Nottingham, Oct. 9, 1906. W. J. CECIL HAYWARD.

[ENCLOSURE.]

THE GAS QUESTION.

To the Editor of the "Nottingham Guardian."

Sir,—Your space has so generously been granted me in the past, to enable me to press forward the great fight against municipal mismanagement (so especially noticeable in regard to the gas undertaking), that I am again impelled to use your columns in order that I may at least do justice to the Engineer, and also deal with the shameful manner in which the Council have allowed the matter to be hushed up, not even the guilty one being pointed out or the slightest modicum of blame apportioned. I deal more with this later.

Your readers will doubtless remember how I anticipated the discovery of the adulteration, and how I have testified in the past to the miserable and insufficient light obtainable, though using incandescent fittings, as advised by plumbers; and up to the time of the appointment of the Special Committee, I passed manyserious adverse comments upon Mr. Brown, which I now fear were entirely undeserved, and which—rightly apportioned—should be resting upon the shoulders of his Committee.

Recently my firm had occasion to complain as to a minor defect in a fitting, and as a result it was put right; and then advice was given us as to a proper system of lighting, which when tested proved highly efficacious and in every way satisfactory. Moreover, by following out his recommendations as to burners, the heat obtained for the furnace is wonderfully increased. Profiting by this, in my own home, I have followed the advice given, and recognize that much blame has unjustly been bestowed upon the gas, and much more upon the Engineer. It is therefore with pleasure that I utilize your columns to thereby testify as to the efficiency of the gas, in the hope that by so doing I may persuade others to seek the advice of the Engineer with regard to their fittings and any cause of complaint that they may have, feeling assured that they will find such action to serve their best interests. I owe it to the Gas Committee and to Mr. Brown to make this testimony, and am pleased to do so.

Referring to the Council meeting, the thanks of the city are due to Sir John Turney and his colleagues for the exceedingly unpleasant duty they have recently discharged; yet we cannot but deplore the fact that the Committee were not sufficiently strong to apportion blame, instead of returning such an exceedingly unsatisfactory verdict. In justice to the Engineer or Mr. Harlow, this should have been done. If the charges were true, the Engineer should have been discharged. On the other hand, if the grave and most serious charges made by Mr. Harlow were proved groundless, then that justice of which Englishmen are so proud demands that Mr. Harlow should make amends, more especially so as these statements were made when Mr. Harlow was acting as Chairman of a great and important trading Committee. Both cannot be blameless. The Committee will not say which one it is that is in fault, but take refuge in a verdict that may mean anything. Such verdict is not calculated to serve the best interests of municipal purity, or to inspire responsible officials with any feeling of security in the discharge of their duties. They must rather feel that charges of the gravest nature may at any time be made against them without reparation being enforced. As it is, the question is not ended, but private individuals will have to labour hard to secure that the truth shall be known, and that justice shall be done, even though to secure this end a Board of Trade inquiry be obtained, or proceedings taken in the High Court of Justice. Honesty and justice alike compel us to labour on in this campaign, and thus prevent the matter resting unrectified—a scandal to the city, and a lasting reproach upon municipal trading.

The rumours that are prevalent are so serious that, in the interest of the community, they should be now proved either false or true. One cannot but feel that Alderman Jelley played the game unfairly in using his influence and position to make a personal attack upon the Engineer. He should have remembered that he himself was being judged. To speak when the other man was not allowed to state his case, is a most unjustifiable act; and remembering how, some months ago, there was made a similar attack, such action was all the more reprehensible. We must and do insist that the truth shall be made manifest, and that justice shall be done ere we allow the matter to be forgotten. We would ask Alderman Fraser why everyone who had given evidence should have had to be assured that he need experience no fears of the law of libel. One has yet to learn that the truth cannot be spoken unrestrainedly in such an inquiry. Hereafter uneasiness as to our municipal undertakings must ever be felt. Why does Alderman Fraser go out of his way to threaten the Engineer, when the strength of his party is sufficient to secure the dismissal of that official?

In the interests of municipal honesty and the securing of purity in the administration of our local municipal trading ventures, it is greatly to be deplored that the bulk of the Council were so lacking in a sense of their duties, and content to receive the report without satisfactory explanations being forthcoming. I trust that at the forthcoming municipal contests this question will be made a prominent feature, and that the councillors seeking re-election shall be compelled to account for their actions herein. It is most necessary that good men should be sent back to the Council, who will not consent to be party tools, but who will insist upon a pure administration, and who will allow no suspicion of corruption to pass by unnoticed or unexposed. Yesterday's action of the Council will exercise a powerful influence over all intelligent electors for a considerable time to come.—I am, Sir, &c.

Oct. 2, 1906. W. J. CECIL HAYWARD.

Gas Suffocation Case at Acton.—A widow lady and her daughter, who had not been seen for a week or more, have been discovered in their house in Shalimer Road, Acton, dead from the effects of coal-gas poisoning. It is thought that the affair was the outcome of an accident, as an examination of the room showed that there was an escape of gas from a chandelier. In all probability the ladies were suffocated in their sleep.

Swansea Gas Company.—The half-yearly general meeting of this Company was held on the 5th inst.—Mr. T. Travers Wood in the chair. In their report for the six months ended June 30 last, the Directors stated that the accounts showed a profit of £9567; and they recommended the payment of the statutory dividend of 5 per cent. per annum and the carrying forward of £203 to the balance brought from previous accounts, which would then amount to £7334. The quantity of gas sold during the half year showed an increase of 4 per cent. The second installation of 96 inclined retorts, together with the elevating and conveying machinery, had been completed, several important alterations and additions made in the works and distributing plant, and 2250 yards of 18-inch main laid to the western district of the town, to meet the rapidly increasing demand for gas for ordinary and prepayment consumers and cooking stoves. The Chairman, in moving the adoption of the report, congratulated the shareholders on the results of the half-year's work. He also expressed the Directors' pleasure in entertaining the members of the Wales and Monmouthshire Institution of Gas Engineers on the occasion of their recent meeting, as much benefit accrued from the visits of associations of gas engineers to different towns. The report was adopted, and a dividend of 5 per cent. per annum was declared.

LEGAL INTELLIGENCE.

MARLBOROUGH STREET POLICE COURT.

Wednesday, Oct. 10.

(*Before Mr.* PLOWDEN.)

Defective Electric Lighting in Marylebone—The Corporation Fined.

The Mayor, Aldermen, and Burgesses of the borough of St. Marylebone were summoned to-day by Mr. W. J. Haddock, a Director of Messrs. Mappin and Webb, Limited, of Oxford Street, for failing, on five consecutive days in September and a like number of days this month, to maintain a supply to the firm's premises of sufficient electric energy for their use, contrary to the regulations of the St. Marylebone Electric Lighting Order, 1901.

Mr. ARTHUR NEWTON and Mr. A. W. HOLT supported the summonses; Mr. R. M. MONTGOMERY represented the Corporation.

Mr. NEWTON said that Messrs. Mappin and Webb were supplied with electrical energy for lighting purposes by the Marylebone Borough Council in accordance with an Order made under the Electric Lighting Acts of 1882 and 1888. For some months the firm had complained of the insufficient light, and correspondence had passed between the parties on the subject. Under the Order, those who supplied the electrical energy had to state to the consumer the pressure they would maintain. This pressure was allowed to vary only 4 per cent. below or above that stated; so that if the voltage was fixed for 100, as it was in the present case, it ought never to go lower than 96 or higher than 104. If it varied more than this, there was the liability of the supplier being penalized in the sum of £5 for every offence. After the summonses for dates in September had been issued, the light continued so bad that fresh summonses had been taken out for the beginning of October, making ten in all. The complainants' meter was watched and checked by an employee, who would state that on Sept. 24 the voltage varied from 84 to 95, instead of being at least 96. Only once was the proper voltage reached; and there was a shortage for all the other days mentioned in the summonses. The voltage was not kept up to the standard; and the only reason that could be suggested was that the main conducting the energy was not large enough. Mr. Haddock would say that there had been a promise made to put in a new cable; but this was not done. He (Mr. Newton) should ask for the full penalties to be imposed if the case were proved, as complainants had not brought the Corporation before the Court precipitately. They had made numerous requests.

Mr. *Haddock* said there were other companies supplying them with light until the Borough Council took over the undertaking, and although a voltage of only 50 was mentioned in the former agreement, they had never received as low as 50, but always 100, with the exception of the shortage now complained of.

In cross-examination, witness stated that the Council adopted the 240-volt pressure system; but the firm refused to give their sanction, and the Council obtained over their heads the consent of the Board of Trade.

Mr. PLOWDEN asked Mr. Montgomery why the Council, if they had this consent, did not instal the 240 voltage system at complainants' premises or refuse to supply them at all.

Mr. MONTGOMERY explained that, notwithstanding this consent, they could not enter the firm's shop to carry out the alteration without their approval. Not wishing to be high-handed in the matter, the Council continued to supply them temporarily with a 100 voltage, which, however, entailed unnecessary expense, because they were supplying the district generally with a 240 voltage; this higher voltage being much cheaper to produce. Although all expenses incurred in making the alterations for installing the higher voltage would have to be met by the borough, the complainants refused to have it.

Witness said his firm refused because their Electrical Engineer considered that in the consumption of energy at the higher voltage they would probably have to pay for it at a rate which would be 33⅓ per cent. more than they were paying for the voltage of 100. All his firm wanted was a proper light.

Mr. *Rashleigh Phipps*, Electrical Engineer, supported Counsel's opening statement by expert evidence.

An employee of the complainants said that owing to the bad light oil-lamps and candles had to be used. The Council had recently put a new electrical machine into the premises, and the light had since been better and more satisfactory.

Mr. MONTGOMERY submitted that the defendants had no case to answer, because the only voltage that had been declared, as required by the Order, in an agreement with Messrs. Mappin and Webb was 50; and although 100 was actually supplied instead of the 240 which ought to have been given, this was a matter of arrangement between the Council and the complainants, and any deficiency below the 100 did not render the borough liable to any penalty in a Police Court. If the complainants had agreed to the 240 voltage, they could have demanded and compelled the borough to supply the voltage under penalty; but as the 100 voltage was supplied at their own request, they could not demand the 100 to be kept up.

Mr. PLOWDEN, in giving his decision, said it was not disputed that on ten days there was a serious diminution of light in the complainants' premises on the basis of 100 volts; and the question was whether the defendants were to be held responsible for the deficiency. Having obtained the consent of the Board of Trade to the alteration of the voltage, the Council did not say that the complainants must accept the 240 volts or nothing, but continued to supply at the old rate of 100 volts. Having taken this course, they were thrown back to their original position; and there was obviously no answer to the case. The defendants were to blame throughout, and they must pay the full penalty of £5 on each of the summonses, and £10 10s. costs (£60 10s. in all). If there were future defaults, there would be a continuing penalty of £2 a day.

On the application of Mr. Montgomery, his Worship consented to state a case on a point of law.

MISCELLANEOUS NEWS.

PROFIT-SHARING IN GAS-WORKS.

The following statistics relating to co-partnership and profit-sharing in connection with gas companies are taken from the current number of "Labour Co-Partnership," the monthly organ of the Labour Co-Partnership Association:—

Name of Company.	Total Capital in 1904.	No. of Employees under Agreement for Profit Sharing or Co-Partnership.	Amount Divided among Employees for Year ending June, 1906.	Amount Per Cent. on Wages.
South Metropolitan .	£8,245,445	About 5000	£43,962	9¾
Commercial	2,478,280	1236	5,742	5½
South Suburban. . .	788,415	532	2,867	6
Newport	291,151	300	401	2·41
Chester	181,413	69	284	5

Name of Company.	Number of Years Scheme has been in Operation.	Total Profit to Employees Since Scheme was Adopted.	Amount of Shares and Deposits Held by Employees in the Company. Market Value (about).	May Employees be on the Board of Directors.*
South Metropolitan .	Since 1889	£345,214	£309,000	Yes.
Commercial	,, 1901	23,446	30,043	No.
South Suburban . .	,, 1893	24,920	27,000	Yes.
Newport	,, 1900	2,103	1,524	No.
Chester	,, 1901	795	981	No.

* Only two of the Companies—the South Metropolitan and the South Suburban—may have employee representatives on the Board. The former Company have had three since 1898; and the latter elected two last year.

Commenting on the above figures, the Editor makes the following remarks: "The methods by which labour co-partnership can be worked out are numerous, and every successful experiment makes others more possible. The force of example is seen in the case of gas companies. We give the figures concerning these for the past year. What do they show? In the case of the South Metropolitan, we see that the 5000 employees have received under the co-partnership scheme no less than £345,214, or nearly £70 per employee; and, more important still, these same employees possess of the Company's capital £309,000, or over £60 per employee. In addition to the capital accumulated in the Company, money has been withdrawn by the employees, or advanced to them, to the extent of £61,000 for the purpose of enabling them to buy their own houses. Figures presented by Mr. Bush at the annual dinner showed that the 167 employees selected by ballot from among the employees to attend possessed an average of £111 each in the capital of the Company, or a total of £18,542. These facts relate to the pioneer of co-partnership among gas companies; but the South Suburban and the Commercial Companies are able to present most encouraging figures, while Newport and Chester are making steady progress. The five Companies have, in the aggregate, shared £396,478 among their 7137 employees, and £368,558 is now standing to their credit in the capital of the different concerns. At the same rate of progress which has prevailed for the last two or three years, the total credited to the employees in another two years will exceed £500,000. It is interesting to know that many of the men hold the stock in the joint names of themselves and their wives. The figures cannot give the real measure of the value of the changes in the circumstances of these workers. That large numbers of men now possess £100 who never had a hundred pence before, is a great thing. A greater thing, however, is the change in the habits and thought of the men, due, in part, to the sense of possession, and more still to the way in which it has been acquired. It is difficult to believe that there are not hundreds of opportunities for employers, companies, and co-operative societies to take steps in the same direction; and we venture to hope that in the near future more will realize the importance of action in this direction."

GAS-WORKS PROFITS AT BRADFORD.

In the course of a statement dealing with the position of the various trading undertakings of the Bradford Corporation, Alderman Wade, the Chairman of the Finance and General Purposes Committee, remarked that the gas concern was rich in its history of profits. In its earlier years, it contributed as much as 8d. in the pound in relief of rates, and in addition lighted the public streets out of profits. Compared with to-day, when the rates received practically no assistance from profits, but on the contrary when they were bearing the street lighting expenses, it made a difference of 1s. in the pound, which was aforetime borne by the gas profits. That was at a time when gas was 3s. 4d. and 3s. 6d. per 1000 cubic feet, as against 2s. 1d. gross per 1000 feet to-day. With gas at 2s. 1d., however, the department kept on its feet, though probably in practice the great body of ratepayers did not appreciate a low price of gas, with a correspondingly high poundage rate, so much as they would a reversal of these conditions. The capital sunk in the gas-works is £1,155,079. The total revenue from the sale of gas, including the rental of meters, was £191,287, as compared with £190,245 in the previous year. The total revenue, including residual products and sundry matters, was £291,303, as compared with £289,515, or an increased income of £1788. The working expenses for the year were £223,671, as against £229,111, or a decrease

of £5440. There was, therefore, a trade profit of £67,632, as compared with £60,404. Interest and sinking fund charges absorbed £61,610, leaving a net profit of £6022 for the year. The unappropriated profit at the end of the financial year was £5438. The renewal of mains, services, retorts, &c., was charged direct to revenue; and the department had a restoration fund of £25,000.

It might, he said, be incidentally pointed out that of the £6022 net profit of last year, £4908 represented profit on the manufacture and sale of chemicals. Consequently, the profit upon the manufacture and sale of gas (for which purpose the Gas Committee were primarily constituted) was reduced to £1114. As showing the danger, therefore, of working at a figure too near what appeared cost price, one had only to reflect for a moment upon the fluctuating market for coal and residuals to understand that this small profit might readily be turned into a loss through circumstances over which the Corporation had not the slightest control. Any serious fall in the value of tar and other products, or an increase in the price of coal (200,000 tons of which were carbonized annually), would turn the scale unpleasantly. It was worth mentioning, for the information of the Council, that the Bradford price per 1000 feet was 1s. 11½d. net, as compared with an average of 2s. 5½d. net in eighty-three towns. Thirty-eight towns alone last year appropriated towards the relief of rates from gas profits a sum of £378,125, which averaged £9950 per town.

ROCHDALE AND FREE COOKERS.

It was stated in the "JOURNAL" a fortnight ago that the Rochdale Corporation Gas Committee had instructed Mr. T. Banbury Ball, their Engineer, to write to Lancashire corporation gas authorities in order to ascertain: (*a*) The number of corporations who supply gas-cookers free of charge; (*b*) The number who fix the same free of charge; and (*c*) The price charged for gas for cooking purposes. Mr. Ball thereupon addressed inquiries to thirty towns (all but two—Huddersfield and Halifax—in Lancashire) similar in character to Rochdale; and the replies have been submitted to the Committee.

The names of the towns from which information was sought, together with the answers to the third query, are as follows:

	Lighting. Per 1000 Cubic Feet.	Cooking. Per 1000 Cubic Feet.
	s. d.	s. d.
Accrington	3 2 less 2½ per cent.	2 10 less 2½ per cent.
Barrow	2 6	2 6
Blackburn	3 0 less 5 per cent.	3 0 less 5 per cent.
Blackpool	2 4	2 4
Birkenhead	2 6	2 6 slots 3s. 4d.
Bolton	2 9 less 3d.	2 9 less 3d.
Bury	1 11	1 11
Burnley	2 3 less 10 per cent.	2 3 less 10 per cent.
Clitheroe	3 2 less 4d. under 150,000 c.f.	3 2 less 4d. under 150,000 c.f.
Chorley	3 1 under 200,000	3 1 under 200,000
Colne	2 9 less 5 per cent.	2 9 less 5 per cent.
Darwen	2 9 less 2½ per cent.	2 9 less 2½ per cent.
Heywood	2 10	2 4 to 2s.
Halifax	2 3 less 8½ per cent.	2 3 less 8½ per cent.
Huddersfield	2 6 less 5 per cent.	2 1 less 5 per cent.
Lancaster	2 0	2 0
Leigh	3 3 less 3d.	3 3 less 3d.
Manchester	2 3	2 3
Middleton	3 5 less 2d. under 500,000 c.f.	3 1 less 2d. under 500,000 c.f.
Nelson	2 3	2 3
Oldham	2 8 less 6d. under 100,000 c.f.	2 8 less 6d. under 100,000 c.f.
Salford	2 7 to 3s. less 4d.	2 7 to 3s. less 4d.
Stalybridge	2 1	2 1
St. Helens	2 2 less 5 to 12½ per cent.	2 2 less 5 to 12½ per cent.
Southport	2 8 less 5 per cent.	2 8 less 5 per cent.
Stockport	2 6 less 2d.	2 6 less 2d.
Todmorden	2 8 less 12½ per cent.	2 8 less 12½ per cent.
Warrington	2 6	2 6
Widnes	1 3 under 3 mil.	1 3 under 3 mil.
Wigan	2 10 less 10 per cent. under 150,000 c.f.	2 1 less 10 per cent. under 150,000 c.f.
Rochdale	2 6 to 2s. 3d. net	2 0 to 1s. 6d. net

Thus in 26 of the towns the same charge is made for cooking as for lighting. In 15 the charge for lighting is higher than at Rochdale, and at 10 lower; while only at Widnes and Bury is the charge less for cooking purposes than at Rochdale.

Only four corporations let out gas-cookers free of charge—Chorley, Manchester, Oldham, and St. Helens. At Accrington, the system is three years' hire-purchase or cash; and at Darwen, three or six years' hire-purchase. At Barrow, Birkenhead, Heywood, Halifax, and Huddersfield cookers are free with slot-meters only; and at Blackpool, Bury, and Bolton grillers only are free.

Many of the authorities fix cookers free. Those who do so are Barrow, Blackpool, Birkenhead, Bury, Clitheroe, Colne (if kept two years), Darwen, Heywood, Halifax (if twelve months' rent is paid in advance), Huddersfield, Leigh, Manchester, Middleton, Nelson, Oldham, Stalybridge, Southport, Stockport, Todmorden (if kept two years), Warrington, Widnes, and Wigan. At Accrington, half-price is charged for time and piping; at Bolton and Salford, the cost of fixing is included in the charge for hire-purchase; and at Burnley, Chorley, and St. Helens, a charge is made for materials only. There are two towns out of thirty where a charge is made for fixing the cookers—Blackburn and Lancaster.

The Frimley Urban District Council and the Water Company.—At a recent meeting of the Frimley Urban District Council, a Committee was appointed to consider the advisability of acquiring the undertaking of the Frimley and Farnborough District Water Company.

EXHIBITION OF GAS APPLIANCES IN DUNDEE.

An exhibition of gas appliances was opened in the Drill Hall, West Bell Street, Dundee, last Wednesday evening. The organizers are the Corporation of Dundee. An extensive and very effective display of goods, as well as of appliances at work, has been brought together, a more detailed account of which will be given in next week's "JOURNAL." Mr. G. Stevenson, the Convener of the Corporation Gas Committee, presided at the opening ceremony, which was attended by members of the Town Council, Mr. A. Yuill, the Corporation Gas Engineer, and a number of gas managers in the Dundee district. Mr. Stevenson said the Drill Hall, which was the city's largest and least attractive hall, had never presented a finer appearance than it did that evening. In its transformed state, it well deserved a visit from all householders during the exhibition. When people saw undertakings like the water, tramways, gas, and the like, and the excellent set of officials managing them, they ought to be encouraged, and not discouraged, in taking part in municipal work. Lord Provost Longair, in declaring the exhibition open, said it was due to the energy and enterprise of the Gas Committee, aided by the skill of their excellent Manager, Mr. Yuill, that the interesting and brilliant exhibition had been arranged. It was not a very distant date since the affairs of the Dundee Gas-Works looked very dark and disappointing; but a better and brighter day had dawned, and the gas undertaking was now one of the most flourishing of their municipal concerns. Perhaps eighteen or twenty years ago he was not altogether singular in thinking that the manufacture of gas was to be summarily superseded by the new illuminant, electricity. It was very curious, however, that in Dundee and other towns where the two were produced side by side, they had continued to develop and become cheaper. It was an interesting fact that for illumination, motive power, and especially for cooking purposes, coal gas seemed to be growing steadily in favour. Bailie Martin conveyed the thanks of the Gas Committee to the exhibitors for their assistance in transforming that place of darkness into a palace of light. Mr. A. P. Main, of Glasgow, in acknowledgment, said that gas was now coming into its own field. Since the introduction of electric light, there had been an enormous increase in the manufacture and sale of gas. Mr. D. Macfie, of Edinburgh, proposed a vote of thanks to Mr. Stevenson, who, in replying, mentioned that since they held an exhibition last year the quantity of gas consumed in cooking and heating had increased by 50 per cent. The exhibition is to remain open till the 24th inst. The lecturer is Miss E. M. Dods, Principal of the Dundee School of Cookery.

GAS AND ELECTRICITY AT FAVERSHAM.

A Question of Finance.

Alderman Child has been telling his fellow-members of the Faversham Town Council pretty plainly what his views are with regard to the respective costs of gas and electricity for street lighting in the town—there being about an equal number of lamps on each system.

After remarking that he had gone into the matter carefully, Alderman Child said that for the electric light the ratepayers were charged £350 for the half year—this was for the actual light. For repairs and renewals, an estimated sum of £125 had to be added; and there was another item which ought also to be charged—namely, half the cost of fuel used at the works. The amount he put down for that was just half what the estimate was, £126. The total cost, therefore, of lighting half the town with electricity for six months was £601. The cost of the incandescent gas-lamps for a similar period was £320; so that in the case of the electric light they were paying £281 more—and for an inferior article, the gas-lamps giving a much better light, and being more satisfactory to everyone. The ratepayers of the town were suffering tremendously by what they had to pay for what he might call their own material; for, having raised a sum of nearly £25,000 to establish the undertaking, the electric light was surely their own article, and yet they were charged nearly double the amount at which they could get light from a company. They talked about monopoly; but here was a monopoly, a crushing, vicious monopoly. In one year they paid £752 more for electic light than they did for gas. It was stated that at the present time the electric light concern was more than paying its way. Of course it was paying its way—the Council paid for everything it had; but where did the money come from? Out of the ratepayers' pockets, not out of the undertaking. If this was a limited liability company, and there were no ratepayers to fall back upon to make up the deficiency, where would they be? Why, they would be in the Bankruptcy Court. A lot of money had gone; and it struck him that there were a good many thousands more going. In the accounts nothing was allowed for depreciation; whereas on machinery, and specially on this kind of machinery, there should always be from 5 to 10 per cent. allowed annually for this item. And there was no reserve fund; so that if there was a breakdown to-morrow, and it was necessary to replace some of the plant, there was nothing to meet the cost. Where would they get it? Out of the poor ratepayers' pockets, of course! It was a splendid way of carrying on business.

Alderman Child concluded by giving notice that at the first meeting of the General Purposes Committee after Nov. 9, he would propose that incandescent gas-lamps be again used in all the streets, and the electric ones done away with. By this means, he said, he was positive the ratepayers would be saved £500 a year at least. They must face the matter squarely. He would admit that there was no one more enthusiastically in favour of the electric light than himself when it was introduced; but he had since seen the great mistake he made, and had been sorry for it. The Council as a body should also not be too proud to acknowledge that they had made a mistake, and proceed to mend their ways. With the street-lights abolished, one of the engines at the works would be sufficient; and the other could be ready in case of a breakdown.

LONDON COUNTY COUNCIL AND GAS SUPPLY.

At the weekly meeting of the London County Council to-day, the Parliamentary Committee will present the usual report on the work of the session. With regard to Gas Bills, they state that the promoters of the Gas Companies (Removal of Sulphur Restrictions) Bill agreed to insert a clause as to testing by the Wandsworth Borough Council for calorific power and sulphur impurities. No further action was necessary, and the Bill passed. In the case of the South Metropolitan Bill, clauses were agreed; but the Bill was withdrawn when before the Committee. Clauses and amendments were agreed, fixing the illuminating power at 14 candles and the standard price at 2s. 9d. per 1000 feet, and providing for tests for illuminating and calorific power, in the South Suburban Gas Bill. No further action was necessary, and the Bill passed. The Wandsworth and Putney Gas (Removal of Sulphur Restrictions) Bill was withdrawn.

ELECTRIC LIGHTING ENTANGLEMENT AT BO'NESS.

The Transfer of Powers by Local Authorities.

The Bo'ness Town Council find themselves in a difficulty, owing to the position taken up by the Board of Trade with regard to an agreement entered into by the Council with the National Electric Construction Company, Limited. Last July, application was made to the Secretary for Scotland for authority to borrow a sum of £4000, to defray over-expenditure on the original scheme under the Borrowstounness Electric Lighting Order, and to carry out future extensions; and this was the point at which the trouble arose.

The attention of the Council was drawn by the Scotch Office to the decision in the case of the *Sudbury Corporation v. Empire Electric Light and Power Company;* and it was stated that, in view of this decision, and of the agreement between the Bo'ness Council and the National Electric Construction Company, there appeared to be a difficulty in the Secretary for Scotland's granting his consent to the borrowing of further money by the Council for the purposes of the 1903 Order. It was suggested that the Council should communicate with the Board of Trade as to the proper course for them to adopt in the circumstances. In the Sudbury case the Corporation had entered into an agreement with the Electric Lighting Company, and were suing the Company to proceed in terms of their contract to fit up an electric installation in their town. In the agreement appeared the following clause, which is in similar terms to one contained in the Bo'ness agreement: "The Company shall pay all costs, charges, and expenses whatsoever on, and in connection with, the manufacture and supply, and of the collection and recovery of the revenue and receipts, and all rates, taxes, assessments, &c." Justice Warrington, dealing with the clause, declared that it was obvious that the idea of both parties was to transfer the entire business of supplying electricity to the town of Sudbury from the Corporation to the Company, and to do so without the consent of the Board of Trade. Such an agreement was prohibited by section 2 of the Electric Lighting Act of 1882, and could not be enforced. He therefore dismissed the action with costs against the Corporation.

Subsequently, the Hon. T. H. W. Pelham, the Secretary to the Board of Trade, wrote to the Council stating that the Board were not prepared to consent to any divestiture by undertakers of their powers under an Electric Lighting Order, save in cases where special authority in that behalf was obtained by the undertakers by a provision in an Order granted by the Board under the Electric Lighting Acts. At the same time, he said, the Board had had before them several cases in which local authorities had entered into agreements of a similar character to that entered into by the Borrowstounness Council; and in order to remove the legal difficulties which had arisen, the parties in certain instances proposed to enter into fresh agreements by which the local authority would lease the existing works to the Company, and would transfer their powers to the Company (after having first obtained a further Order to enable them to do so)—the transfer to be complete, all capital money required for the undertaking during the term of the transfer to be provided by the Company, and the existing agreement to be cancelled. He enclosed a draft form of agreement which had been proposed as a basis for carrying out this procedure; and added that the Board were informed that, in the event of the procedure outlined herein being adopted by the Borrowstounness Town Council, the Secretary for Scotland would be prepared to consider an application from the Council for his consent to the borrowing of such further sum as might be necessary to defray the cost of capital works under the Borrowstounness Electric Lighting Order, 1903, up to the date of the transfer of the undertaking.

When this correspondence came before the Town Council at their monthly meeting last week, the Town Clerk remarked that the gist of the agreement which the Board of Trade sent was that the Town Council should lease the whole of the electric light undertaking to the Company; they simply paying the Council a rent to cover sinking fund and interest charges. Armed with the complete correspondence, he reported to Mr. Cownie, the Manager of the National Electric Construction Company, and asked his opinion as to the course to be followed in view of the decision of the Board of Trade. Mr. Cownie, in the course of a long reply, expressed surprise at the action of the Scottish Office in the matter. He thought the Bo'ness agreement was perfectly valid, and did not amount to a transfer or divestiture of any of the Council's powers under their Order. He stated that they were exactly in the same position with the town of Carnarvon; and after interviews with the Board of Trade and the Local Government Board of England, the Board of Trade here again suggested that a fresh Order be applied for, and made it a condition that the Corporation were not to be interested in the profits in any shape or form. Mr. Cownie further stated that the Corporation of Carnarvon unanimously agreed to apply for a Private Bill making the agreement law. Mr. Lloyd-George had, however, been recently in Carnarvon, and asked them not to proceed further until he had had an opportunity of considering the position again; and he stated that he would do everything possible to get the present agreement through without the expense of obtaining a Private Bill. After the reading of further letters, Provost Stewart said the correspondence showed the Company did not want to break through their obligations. They would observe, further, that they were not alone in this matter; and that the burgh of Hamilton were displaying interest in the Bo'ness case, as they were shortly to apply for more money, and were to take up the position that the agreements were valid, and had been ratified by the fact of the Secretary for Scotland granting money in the first instance.

It was agreed to instruct the Clerk to communicate with the Board of Trade, and ask whether, in the event of the Council applying for a Private Bill to legalize the present agreement, the Board of Trade would oppose such a measure. At the same time, it was agreed to solicit the support of the Lord Advocate and Solicitor-General for Scotland on the matter; and Provost Stewart was authorized to interview these law officers on the whole subject in London, with a view to getting the agreement through, and thus avoiding, if possible, the expense of a Private Bill.

The complication is increased by the fact that the Council, relying on authority being granted, have paid up to the Company the over-expenditure to the extent of about £2000, borrowed temporarily from the burgh sinking funds.

NOMINEE GAS DIRECTORS AT SHEFFIELD.

At the October Meeting of the Sheffield City Council, Alderman Batty Langley, M.P., Alderman Stuart Uttley, and Mr. C. F. Bennett were appointed Nominee Directors of the Sheffield United Gaslight Company. Thereupon Alderman Styring moved that the following be a Standing Order of the Council—"The Nominee Gas Directors shall present to the Council at the next meeting of the Council, and afterwards at the September meeting of the Council in each year, a report relating to the Gas Company, containing the following and such other particulars as they consider desirable: The state of the Company's capital and loan account, and the amount unexpended and the sum expended during the Company's previous financial year. The estimated capital expenditure for the then current year. The capacity of the Company's works, and the quantity of gas sold during the last financial year. The increase on the previous year's sales. Any proposed extension of the Company's gas-producing works, and the probable cost of same. Any contemplated application for further parliamentary power, whether by Bill or Provisional Order, to raise further capital or to extend the Company's works. The Committees and Sub-Committees of which the Nominee Directors are members and the number of meetings of the Board and Committees and Sub-Committees and the attendance of each Nominee Director at such meetings. That it be the duty of the Town Clerk, in the month of July in each year, to notify this Standing Order to the Nominee Directors." In doing so, he remarked that there were certain duties placed upon the Nominee Gas Directors; and he did not think the Council up to the present time had required these gentlemen to discharge all the duties that they ought to do. His object was simply that the interests of the Corporation, and through them the interests of the citizens, should be watched by the Nominee Directors; and he did not make the motion in any controversial spirit. It ought to have been enacted a long time ago.

Alderman Senior said he did not think the Corporation ought to take any active part in harassing the Gas Company, who had served the town very well. Alderman Langley, M.P., asked if Alderman Styring would withdraw his motion, on the understanding that the Nominee Directors would present an annual report to the Council, in which they would refer to all questions of importance which affected generally the welfare of the people, and the consumption of gas. It was impossible to go into the details presented in this resolution; but if the motion was withdrawn, the Nominee Directors would see what could be done in the direction Alderman Styring wished. Alderman Uttley, as a Nominee Director, supported this suggestion. He remarked that he was surprised that he and his two colleagues had not been called upon to report to the Council. Had such a report been made, however, it would have been in favour of the Gas Company as a well-managed concern.

Alderman Styring said that the last thing in his mind was to suggest anything which might indicate distrust in the Nominee Directors; and on the understanding given, he was prepared to withdraw his motion.

JUBILEE OF THE SETTLE GAS COMPANY.

The Jubilee of the Settle Gas Company was celebrated last Wednesday week by a supper and social evening, at which over fifty shareholders and friends were present; and advantage was taken to present an illuminated address to the Chairman (Mr. J. W. Shepherd). In making the presentation, Mr. T. Harger, one of the Directors, remarked that Mr. Shepherd had been a member of the Board for a quarter-of-a-century, and Chairman for over twelve years. When he (Mr. Harger) bought his shares, the gentleman he purchased them from said that the Company was going down; but it had paid 10 per cent. now for a good number of years.

In thanking the subscribers, Mr. Shepherd made some interesting references to the history of gas supply in Settle. He said there was no gas in the place until 1851, when a lease of some ground was taken in Kirkgate by the London Vegetable Gas Company, who carried on the manufacture of gas from oil for a few years, but eventually gave up, being unable to make ends meet—in fact, the loss each year was considerable. In the year 1856, a number of Settle gentlemen took upon themselves the onerous duty of forming a company to purchase this questionable undertaking. After the first year's work, instead of

losing money as their predecessors had done, they paid a dividend of 3 per cent. When the lease of the property which the Vegetable Gas Company had held was getting to its end, in 1860, ground for new works was acquired in Upper Settle; and it was here that gas was first manufactured from coal in the town. It was just before these new works were vacated that he (Mr. Shepherd) had the honour to be appointed a Director. After a time, this site in Upper Settle proved too small and not very satisfactory (it being too high up); and so the Directors obtained ground for new works near the River Ribble, a short distance from the town. These new works were opened in 1883. They proved most satisfactory in every way. Some people at the time thought that they would never require the great amount of room that they had at their disposal in the new works; but now they had too little space. About ten years ago, they applied for a Provisional Order; and there were then many hard things said about the Company. But the undertaking had been carried on in a business-like manner, and whatever was brought against them could not be proved. Personally, he was pleased with the necessity for a public inquiry, because it enabled the Directors to show the public that, in spite of all that could be said against them, there was no flaw in either the works or the management. They lost nothing by the inquiry which was held, and consequently had no difficulty in obtaining statutory powers. Good dividends had been paid; and they had reduced the price of gas from 7s. 6d. per 1000 cubic feet in 1855 to 3s. 10d. for lighting, and 3s. 6d. for cooking and business purposes.

METROPOLITAN WATER BOARD.

The above-named Board resumed their sittings after the summer recess on Friday last, under the presidency of Sir Melvill Beachcroft, the Chairman. In re-opening the proceedings, he offered his congratulations to the Board as a body, to the Works and Stores Committee, and to the Engineers on the absence of any breakdown in the supply during a season of unusual drought. He said criticism had, of late, been so freely levelled at the Board and their operations, that they might, perhaps, be excused if they uttered a word or two of self-commendation. To have been able to supply during the last three months an average of about 240 million gallons of water a day, and at the end of that time, which was a trying period, find their storage reservoirs only depleted to the extent of one-third of their total capacity, and the Staines reservoirs still three-quarters full, must, he thought, be considered satisfactory from every point of view. The Board would, of course, have much to do to cope with the wants of the increasing population of the future; but he honestly believed that London had some cause for thankfulness in regard to its water supply. The consideration of the scheme prepared by the Appeal and Assessment Committee for unifying the charges of the Board under section 15 (6) of the Metropolis Water Act, 1902, which was presented to the Board of the 20th of July, and noticed in the "JOURNAL" at the time, was adjourned until the next meeting, when the Finance Committee will submit their report on the scheme. The Works and Stores Committee presented returns in regard to the supply of water for the months of June, July, and August. They contained the following particulars:—

	June.	July.	August.
Average daily supply in gallons	240,652,000	251,009,000	247,768,000
Number of houses, &c., supplied	1,049,175	1,050,679	1,052,213
Estimated population	6,824,538	6,832,960	6,843,490
Supply per head per day, in gallons	35·3 (mean)	36·7 (mean)	36·2 (mean)
Do. for corresponding month of 1905	34·5 ,,	37·6 ,,	34·6 ,,
Water in store in impounding reservoirs, at the end of the month, in millions of gallons	6,924	6,596	5,473
Do. at end of corresponding month of 1905	6,434	6,779	6,343
Number of additional supplies	2,060	1,629	1,518
Length of mains laid, in yards	18,712	10,602	9,413

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Invitations have been issued by the Edinburgh and Leith Gas Commissioners for the opening of the second section of the new works at Granton; and the ceremony is fixed for Monday afternoon. It will be almost a counterpart of the proceedings at the opening of the first section, which took place on Feb. 27, 1903. Then the formal opening was entrusted to Mrs. Steel, wife of the Lord Provost of Edinburgh, and Mrs. Mackie, wife of the Provost of Leith. Monday's ceremony will be performed by Lady Cranston, wife of the present Lord Provost of Edinburgh, and by Mrs. Mackie, whose husband is still in office. With the opening of the new works it will not now be necessary to keep standing the old ones in New Street, Edinburgh, the dismantling of which will be undertaken shortly. Gas has not been made in them for a good while, but they have been maintained in a fit condition for work, should they have been at any time required, which, happily, they have not. Henceforth the whole of the gas supply for the district will be made at Granton. In the "Scotsman" of to-day, there is an article descriptive of the works, in which it is said: "The buildings and equipment are a notable example of modern mechanical achievement. They form, in reality, a huge scientifically arranged machine, working with absolute precision and regularity. In it human agency and mechanical device have their equally indispensable parts. They also form a striking illustration of the fact that the best is generally the cheapest. The first section of the works has been in operation for a sufficient time to indicate what the financial result of their erection is to be. That result is this—that the entire new works, which up to May last had entailed an expenditure of three-quarters of a million, have

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 152.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct 12	10½	Alliance & Dublin 10 p.c.	20½–21⅜*	..	4 17 8
245,112	10	,,	7½	Do. 7 p.c.	14–15*	..	5 0 0
200,000	5	May 11	7	Bomt 1y, Ltd.. . . .	6⅝–7⅛	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5–5⅜	..	5 1 10
50,000	10	Aug. 30	14	Bourne-) 10 p.c. . .	28–29	..	4 16 7
51,810	10	,,	7	mouth Gas) B 7 p.c. .	16⅞–17⅜	..	4 1 3
53,200	10	,,	6	and Water) Pref. 6 p.c.	15⅝–16⅜	..	3 12 9
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	260–265	..	4 14 4
300,000	,,	,,	9⅜	Do. New . . .	198–203	..	4 13 7
50,000	,,	,,	5	Do. 5 p.c. Pref. .	120–125	..	4 0 0
206,250	,,	June 14	4	Do. 4 p.c. Deb. .	103–106	..	3 15 6
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	230–235	..	4 15 8
246,320	,,	,,	8¼	Do. A. Ord. Stk. .	163–168	..	4 18 3
460,000	20	Sept. 27	10	British	40⅜–41⅛	..	4 16 5
104,000	Stk.	Aug 15	6	Bromley, Ord. 5 p.c. .	119–123	..	4 17 7
165,700	,,	,,	4⅜	Do. do. 3½ p.c. .	90–93	..	4 16 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd	12–12⅜*	..	5 12 0
250,000	Stk.	June 28	4	Do. 4 p.c. Deb. .	96–98	..	4 1 8
150,000	20	July 12	8¼	Cagliari, Ltd. . . .	24–26	..	6 6 11
100,000	10	Sept. 27	0	Cape Town & Dis., Ltd.	14–15	–⅛	6 13 4
100,000	10	Apl. 26	4	Do. 4½ p.c Pref.. .	9¾–10¼	..	4 7 10
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52–54	..	5 11 1
50,000	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk	98–100	..	4 10 0
118,173	Stk.	Aug. 15	5	Chester 5 p.c. Ord. . .	108½–110½	..	4 10 6
1,443,280	Stk.	Aug. 30	5⅛	Commercial 4 p.c Stk. .	113–115	..	4 10 5
560,000	,,	,,	5	Do. 3½ p.c. do. .	110–112	..	4 9 3
475,000	,,	June 14	3	Do. 3 p.c. Deb. Stk.	84–86	..	3 9 9
800,000	Stk.	,,	6⅛	Continental Union, Ltd.	123–126	..	5 3 2
200,000	,,	,,	7	Do. 7 p c. Pref.	140–145	..	4 16 7
432,070	Stk.	Aug.	5⅛	Derby Con. Stk. . . .	122–124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk. . . .	105–107	..	3 14 9
486,090	10	July 27	11	European, Ltd. . . .	24–25	..	4 8 0
354,060	10	,,	11	Do. £7 10s. paid	18–19	..	4 6 10
15,203,110	Stk.	Aug. 15	4⅛	Gas-) 4 p.c. Ord. . .	98–99	–1½	4 8 11
2,600,000	,,	,,	3½	light) 3½ p.c. max. .	88–90	..	3 17 9
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	107–110	..	3 12 9
4,193,975	,,	June 14	3	Coke) 3 p.c. Con. Deb.	84–86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c	98–103	..	4 17 1
82,500	,,	,,	6⅛	Do. do. 5 p.c.	118–121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½–20⅜*	..	5 7 4
940,000	Stk.	May 11	8	Imperial Continental .	186–189	..	4 4 8
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95–97	..	3 12 2
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c. .	120–125	..	4 16 0
306,083	,,	June 28	4	L'rpool Unit'd Deb. Stk.	107–109	..	3 13 5
561,000	Stk.	Aug. 30	10	Liverpool United A .	230–232	..	4 6 2
718,100	,,	,,	~	Do. B	67½–169½	..	4 2 7
144,140	Stk.	Sept. 13	7⅞	Maidstone 5 p.c. . .	143–148	..	5 3 0
75,000	5	June 28	5	Malta & Medn., Ltd. .	4¼–4⅜	..	5 5 3
560,000	100	Oct. 1	5	Met. of) 5 p.c. Deb..	101–103	..	4 17 1
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	99–102	..	4 8 3
541,920	20	May 31	3¼	Monte Video, Ltd. . .	1½–1⅝	..	5 12 0
1,675,892	Stk.	Aug. 15	4⅜	Newc'tle & G'tesh'd Con	1 0–1 1 2	..	4 2 7
406,625	Stk.	June 29	3½	Do. 3½ p.c. Deb.	98–100	..	3 10 0
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20–21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13⅜–14½	..	4 16 7
300,000	Stk.	May 11	8	Oriental, Ltd. . . .	152–155	+1	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd. . . .	5¾–6⅛	..	5 12 0
398,490	5	Apl. 26	7	Primitiva Ord. . . .	7¼–7⅜	+⅛	4 10 4
796,980	5	July 27	5	Do. 5 p.c. Pref. .	5–5⅛	..	4 15 3
488,900	100	June 1	4	Do. 4 p.c. Deb. .	97–99	..	4 0 10
851,070	10	Oct. 12	7	River Plate Ord. . . .	12½–13*	..	5 7 8
300,000	Stk.	June 28	4	Do. 4 p.c. Deb. .	96–98	..	4 1 8
250,000	10	Sept. 27	8	San Paulo, Ltd. . . .	14–14½	..	5 10 4
70,000	50	July 2	5	Do. 5 p.c. Deb. .	49–51	..	4 18 0
135,000	Stk.	Sept. 13	10	Sheffield A	244–246	+3	4 1 4
209,984	,,	,,	10	Do. B	244–246	+3	4 1 4
523,500	,,	,,	10	Do. C	243–245	+2	4 1 8
70,000	10	May 31	10	South African	16–17	..	5 17 8
6,350,000	Stk.	Aug. 15	5⅛	South Met., 4 p.c. Ord.	32–134	..	4 2 1
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	85–87	–1	3 9 0
201,720	Stk.	Sept. 13	8	South Shields Con. Stk.	156–158	..	5 1 3
575,000	Stk.	Aug. 15	5⅛	S'th Suburb'n Ord. 5 p.c	123–126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	123–126	..	3 19 4
112,533	,,	July 12	5	Do. 5 p.c. Deb. Stk.	128–133	..	3 15 2
502,310	Stk.	May 11	5	Southampton Ord. . .	107–112	..	4 9 3
120,000	Stk.	Aug. 30	6⅛	Tottenham) A 5 p.c. .	125–130	..	5 0 0
388,020	,,	,,	5	and) B 3½ p.c. .	103–105	..	4 15 3
137,500	,,	June 28	4	Edmonton) 4 p.c. Deb.	103–105	..	3 16 2
182,380	10	June 14	8	Tuscan, Ltd.	10⅜–11	..	7 5 6
149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	104–106	..	4 14 4
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	105–107	..	4 13 6
30,000	Stk.	Aug. 15	8	Wands-) A 5 p.c. . .	—	..	—
255,636	,,	,,	6⅛	worth) B 3½ p.c. . .	137–142	..	4 11 7
75,000	,,	,,	5⅜	and) C 3½ p.c. . .	113–115	..	4 17 5
79,416	,,	June 28	3	Putney) 3 p.c. Deb. Stk	82–85	..	3 10 7
779,875	,,	Aug 15	5⅛	West Ham 5 p.c. Ord.	104–106	..	4 .6 6
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	120–123	.	4 1 4
193,300	,,	June 28	4	Do. 4 p.c. Deb. Stk.	103–106	..	3 15 6

Prices marked * are "Ex div.

been secured to the city free of cost to the citizens. Economies of working are responsible for this remarkable achievement. The saving in working expenditure is sufficient to cover interest and sinking fund of the amount spent on the new works. It does more. It has already made possible a reduction in the price of gas. In 1904, the price was reduced by 3d., making it 2s. 9d. per 1000 cubic feet, or lower than it had ever been before. This sum represents a sum of £23,500 per annum." Such a passage as this must be of great service to the gas undertaking, which seldom receives such appreciative notice at the hands of writers for the popular Press.

With the opening of the session of the Western District in Glasgow to-night, the work of the Scottish Junior Gas Association is again in full swing. Mr. J. Bell, of Airdrie, who very worthily filled the Chair last session, was right in congratulating the members upon the success which had attended their every effort. He has given place to Mr. J. M'Leod, of Provan, in whose hands the interests of the Association bid fair to be still further promoted. Mr. M'Leod's connection with the gas industry is as a chemist. This might be gathered from his Inaugural Address as President. Dealing with the subject of the scrubbing of coal gas, he aimed at elucidating, not the commercial results obtained from the plant in use, and the methods of working it, in the gas-works belonging to the Corporation of Glasgow, as a gentleman engaged in the practical working of the plant might have been expected to do, but the scientific nature of the products derived. With ample means for study at his command, and unlimited zeal in his application to the subject, he was able to submit an exhaustive table of results—a table which requires very close study, and which, even with that, will not appeal with much force to the many. To scientists the document will prove exceedingly useful. The appeal which it will make to the many is probably exemplified by the discussion which followed the delivery of the address. The gentlemen who spoke were mostly makers of gas; and to them the question raised in the address was that of the employment of hydraulic main liquor in a certain way, with a faint echo of the position of the cyanogen scrubber. Possibly, however, the address and the discussion would have borne a different character had the President been able to do full justice to his description of the plant in use and the method of working it. His inability to do so arose from the very indifferent working of the lantern (which was an electrical one) by which the illustrations were shown. The Association have re-elected Mr. G. Braidwood to the office of Hon. Secretary and Treasurer, in which capacity he is undoubtedly the right man in the right place. Mr. Braidwood has been able to compile a syllabus of work for the winter months which will give the members abundance of scope for profitable study; and there is every indication that they are prepared to take advantage of the opportunities it will afford them.

In the Selkirk Town Council on Monday of this week, Treasurer Sim moved that it be remitted to a small Committee to report on the best means of putting the burgh in a better position with respect to the supply of gas, and that the Committee be authorized to confer with the Directors of the Gas Company. He said he considered the present position thoroughly unsatisfactory. It was that the burgh had given a very valuable concession to the Company, and for this concession they had received no payment of any kind. The question arose whether that was the best time for dealing with the matter. Of course it was not. The best time would have been a great many years ago; but they were not likely to get a much better chance than they had now. He had put his motion in the widest possible terms, as it was better to have a choice of courses. The course which seemed the best in every way would be for the burgh to acquire the whole concern; or, failing this, they might make some favourable arrangement with the Company. Another course was that the Council might start gas-works of their own; but he did not suggest that this would be advantageous either for the Company or for the burgh. They might also exercise compulsory powers. This was possible; but he did not think it was practicable for them. With the costs of counsel and arbitration, it would be anything but a good bargain for the burgh. He desired that the whole matter be left to a Committee, with powers to confer with the Company. The motion was adopted; and a Committee was appointed.

In the Crieff Town Council this week, Mr. Stewart moved that they consider the advisability of taking over the Crieff Gaslight Company, Limited. A discussion followed, at the end of which it was remitted to the Lighting Committee to bring up a report on the subject.

The Lanark Town Council had before them on Monday the subject of the acquisition of the undertaking of the Gas Company, which came up in a report by Mr. W. R. Herring, of Edinburgh, upon the valuation of the undertaking. Provost Brown suggested that the Council should consider the document in Committee. After some discussion, Provost Brown's suggestion was adopted.

The community of Milngavie, who derive their gas supply from the Corporation of Glasgow, are not content to have to pay so much as 1s. per 1000 cubic feet more than is charged to consumers in the city of Glasgow. At a meeting of the Milngavie Town Council on Monday, Colonel Birrell intimated that he and Provost Martin had had an interview with the Gas Committee of the Glasgow Town Council recently, at which they pressed for a reduction of price, and that Lord Provost Bilsland had promised to get his Committee to go into the matter very carefully, to see what could be done. The result, however, of the Committee's inquiry had been that they could not see their way to lower the price at present, owing to the heavy outlay which had been incurred in laying down pipes in the burgh since the Corporation took over the old undertaking. Mr. Robb thought it was very unfortunate that Provost Martin and Colonel Birrell had taken up the matter without bringing it before the Council as a whole. After discussion, it was resolved that the Convener of the Gas Committee should keep the matter before him, and bring it up again shortly.

A very useful exhibition of gas appliances is being held in Dundee, under the auspices of the Corporation of that city. In ordinary circumstances, some notice would be taken of the event in this column; but as I hope to have the pleasure of seeing the display shortly, I will, in the meantime, defer making any comment upon it.

In the Wishaw Town Council on Monday, Bailie M'Namee said

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NOT ADVERTISING

"THE POSITIVE"

PREPAYMENT METER

THIS WEEK.

SAWER & PURVES,

MILES PLATTING, MANCHESTER.

RADFORD ROAD, NOTTINGHAM.

that they had at present a sum of £1145 at the credit of the revenue account of the gas undertaking; and he moved that they reduce the price of gas to ordinary consumers by 1d. per 1000 cubic feet, and to prepayment meter consumers and users of gas for motive power by 2d. per 1000 cubic feet. That would utilize £315. Mr. Gibson thought that a reduction of 1d. was not worth having, and he moved that only the prepayment meter charges be reduced. The Council, by six votes to three, adopted Bailie M'Namee's motion.

Lord Provost Cuthbert, who, it will be remembered, tendered his resignation of the office of Councillor as well as the provostship of Perth, in consequence of a dispute regarding the sale of gas-mantles, has written to the Town Clerk intimating his withdrawal of the resignation.

CURRENT SALES OF GAS PRODUCTS.

Week ending Oct. 13.

Tar products for the London market remain quiet, but steady. Pitch is still 31s. 6d. to 32s. net. 60° crude carbolic is, if anything, a little better, as is the case with 90 per cent. benzol. Solvent naphtha and ordinary creosote are in good demand. Sulphate of ammonia is distinctly better, and may be called £12 5s. for October, and £12 7s. 6d. for November-December on Beckton terms.

Sulphate of Ammonia. LIVERPOOL, *Oct.* 13.

There has been good demand throughout the week, and towards the close prices have slightly hardened; the quotations being £11 17s. 6d. to £11 18s. 9d. per ton f.o.b. Hull, and £12 2s. 6d. per ton f.o.b. Liverpool and Leith. The Continent remains for the most part indifferent, and that accounts for the relatively low prices ruling at Hull. Home demand is chiefly for spring delivery, autumn requirements having been mainly covered some time ago. In the forward position, considerable purchases have been made at £12 10s. per ton f.o.b. for spring delivery, and £12 12s. 6d. per ton is now being asked. November-December is also inquired for, and £12 6s. 3d. per ton is nearest value, though buyers' views for this position are hardly above £12 5s. per ton.

Nitrate of Soda.

This article is very firm, and spot prices remain 11s. 10½d. per cwt. for 95 per cent, and 12s. 4½d. for refined.

Tar Products. LONDON, *Oct.* 13.

The market has been steady during the past week, with the exception of pitch, which has shown a decided falling tendency for prompt delivery. London makers maintain their price at 31s. 6d. to 32s.; but no doubt second-hand parcels could be obtained at under this, especially for prompt. On the east coast, some of the manufacturers are willing to sell at 30s. for October-March, but they cannot obtain this price; while for prompt delivery 28s. 6oole was accepted. On the west coast they are still fairly firm; but there is evidently some desire to sell on the part of certain makers, who find they have rather more stock than they care to carry to the end of the year. In South Wales, there is very little demand indeed; and consumers do not care to buy unless they can obtain fuel orders, which are rather scarce at present. This also applies to the Continent. Creosote is very firm indeed. Small quantities of London oil could still be obtained at 2d. for delivery to the end of the year, but only from dealers. Manufacturers are fully sold, and will not offer any quantity; believing in an increased demand next year. The American market is reported to be very firm. Good prices have been realized; and manufacturers have now very little to sell. In the North, business has been done at 1⅜d., and this price has also been refused; and it is evident that manufacturers are fairly well sold. In carbolic acid, Continental consumers appear rather anxious to buy for prompt delivery, and are reported to have offered 1s. 9½d. for this month's shipment; while they are still willing to pay 1s. 9d. for delivery to the end of the year. In London, very good prices are reported to have been paid for prompt; but it is evident that makers have very little for disposal. In the Midlands, 1s. 8¾d. has been accepted for January-June. In crystals, there is no change; and prices remain unaltered at nominally 5¾d. for 34-35 per cent., and 6d. for 39-40 per cent. There is still a very firm tone in benzol, especially for London delivery. Makers are reported to have realized 10¾d. for January-March, but only for small quantities; while for this year they are fully sold, and do not care to entertain business except at very high prices. There is little change in 50-90 per cent. Manufacturers appear willing to sell at 1s. 9d. on the east coast; but they cannot obtain this price, business being reported at 11½d. Solvent naphtha still remains firm for prompt delivery; and it is evident that stocks are small, and manufacturers are not inclined to sell except at good prices. Heavy naphthas are also very firm; and there is a good demand for same for delivery all over next year. There is no change in toluol; and prices remain at 1s. 1½d. on the east coast, and 1s. 2d. London.

The average values during the week were: Tar, 16s. to 20s. Pitch, London, 30s. 6d. to 31s. 6d.; east coast, 28s. to 29s. 6d.; west coast, 29s. to 30s. Benzol, 90 per cent., 10½d. to 10¾d.; 50-90 per cent., 11½d. to 1s. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4¾d.; solvent naphtha, 1s. 2d. to 1s. 3d.; heavy naphtha, 1s. 2d. Creosote, London, 2d. to 2¼d.; North, 1⅝d. to 1¾d. Heavy oils, 2⅜d. Carbolic acid, 60 per cent., 1s. 9¼d. to 1s. 9½d. Naphthalene, £4 10s. to £9 10s.; salts, 32s. 6d. to 33s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market all round has been firm during the past week; doubtless owing to dealers having found themselves short, and consequently

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Blackburn	1,250,000	Winnipeg, Man.	500,000	Malton	150,000
Windsor St. Works, Birmingham	2,000,000	Colchester (Second Contract)	300,000	Smethwick	500,000
Saltley Works, Birmingham	2,000,000	York	750,000	Gravesend	300,000
Colchester	300,000	Rochester	500,000	Pernambuco, Brazil	125,000
Birkenhead	2,250,000	Kingston, Ont.	300,000	Duluth, (Second Contract)	300,000
Devizes	120,000	Crystal Palace District	2,000,000	Leicester (Second Contract)	1,000,000
Saltley, Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Newport (Second Contract)	250,000
Windsor St., Birmingham (Second Contract)	2,000,000	Caterham	150,000	Brockville	250,000
Halifax	1,000,000	Leicester	2,000,000	Toronto (Third Contract)	750,000
Toronto	250,000	Enschede, Holland	150,000	Montreal, Ont. (Second Con.)	1,800,000
Ottawa	250,000	Buenos Ayres (River Plate Co.)	700,000	Toronto (Fourth Contract)	1,000,000
Lindsay (Remodelled)	125,000	Burnley	1,500,000	Hamilton, Ont.	400,000
Montreal	500,000	Kingston-on-Thames	1,750,000	Rochester (Third Contract)	1,600,000
Toronto (2nd Cont., Remodelled)	2,000,000	Accrington	500,000	Leeds (Second Contract)	900,000
Belleville	250,000	Tonbridge	300,000	Buenos Ayres (Primitiva Co.)	1,200,000
Ottawa (Second Contract)	250,000	Stretford	500,000	Buenos Ayres (New Co.)	1,200,000
Brantford (Remodelled)	200,000	Oldbury	300,000	Christchurch, N.Z.	300,000
St. Catherines (Remodelled)	250,000	Todmorden	500,000	Rochdale	1,600,000
Kingston, Pa.	125,000	Saltley, Birmingham (Third Contract)	2,000,000	St. John's, Newfoundland	250,000
Peterborough, Ont.	250,000	York (Second Contract)	750,000	Brantford (Second Contract)	400,000
Wilkesbarre, Pa.	750,000	Rochester (Second Contract)	500,000	Smethwick (Second Contract)	500,000
St. Catherines (Second Cont.)	250,000	Newport (Mon.)	250,000	Pontypridd	250,000
Buffalo, N.Y.	2,000,000	Tokio, Japan	1,000,000	Montreal (Third Contract)	1,800,000
		Newcastle-on-Tyne	1,800,000	Guelph, Ont.	50,000
		Leeds	1,800,000	Buenos Ayres (River Plate Co.) Second Contract	750,000
				Belgrano (River Plate Co.)	500,000

And, in addition, COAL GAS PLANTS at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND CALGARY, and WINNIPEG.

been obliged to cover. Beckton state that they are out of the market; but nominally their price may be taken as £12 2s. 6d. for prompt, and they talk of £12 7s. 6d. for the next two months. Other makes could probably be bought at under these figures; but there is not much offering. In Hull, £11 17s. 6d. to £12 is the prompt price, with higher figures spoken of for forward. In Leith, £12 2s. 6d. could be realized, but there is practically nothing offering; while for spring delivery, £12 10s. is being quoted. In Liverpool, the price rules from £12 to £12 2s. 6d.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The quotations for engine and boiler fuel generally show no organized increase. Users of steam coal are more disposed to enter into contracts than a little while ago; probably fearing strike troubles or higher rates. Coalowners, however, are not disposed to conclude negotiations except at an increase of from 3d. to 6d. or more per ton. There is an improvement in the demand for furnace coal; while more gas coal and cannel are going out under contract. Gas coal contracts are practically concluded for the winter period. Coal for shipping is a growing industry. A cargo has just been sent to Constantinople. The quotations are: Best house coal 13s. 6d. to 14s. 6d. per ton, secondary 12s. 6d. to 13s., common 9s. to 10s. 6d., steam and forge 8s. to 9s., best engine fuel 7s. 6d. to 8s. 6d., best slack 6s. 9d. to 7s. 6d., medium 6s. 6d., common 5s. 6d. to 6s., shipping coal 9s. 6d. to 10s. 6d. (best), lower qualities 8s. to 9s. Furnace coke is in steady request.

Northern Coal Trade.

In the last few days, a better demand has set in for coals; for though some shippers would keep back cargoes until after the tax expires, yet those for the North cannot be safely held back. The collieries are thus fairly well employed; and inquiries now come in more briskly for future delivery. Best Northumbrian steams are steady at 10s. 3d. to 10s. 6d. per ton f.o.b., second-class steams are from 9s. 6d. to 9s. 9d., and steam smalls are firm at from 6s. 3d. to 6s. 9d.; but the latter may be varied for sale after the end of the month. In the gas coal trade, the demand is enlarging; and the large contracts that are running take up more of the production, especially of the best Durham gas coals. Prices for occasional cargoes vary from about 9s. 9d. to 11s. per ton, according to quality, f.o.b.; but in one or two cases, the quotation is a little higher. As to contracts, those for the Berlin gas supply are practically settled; but there are varying rumours as to the quantities and the prices—all that can be said is that the Durham collieries have booked at values considerably above those of a year ago. Other contracts are in course of negotiation. Coke is very firm; and gas coke benefits thereby—the quotation for export kinds being from 12s. to 13s. per ton f.o.b.

Scotch Coal Trade.

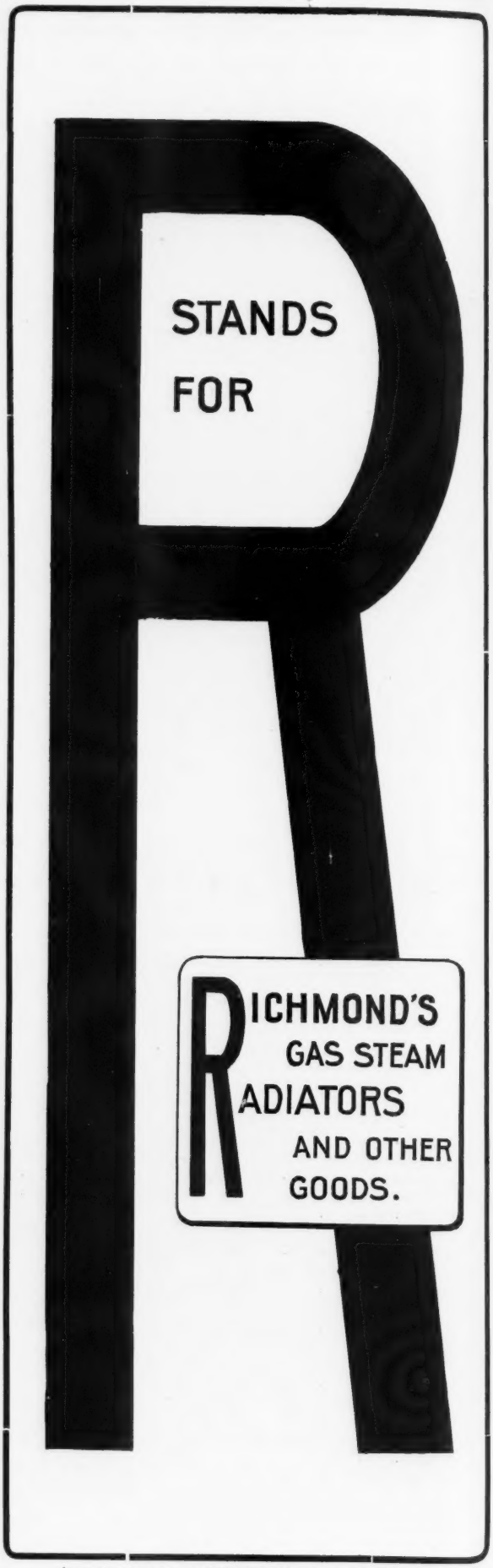
Trade is active; the shipping request being still great. There is a strike of boilermakers in the Clyde district just now, which, if prolonged, will affect the home demand; but as yet it cannot be said to have done so. The prices quoted are: Ell 8s. 9d. to 10s. per ton f.o.b. Glasgow, splint 9s. 6d. to 9s. 9d., and steam 8s. 9d. to 9s. The shipments for the week amounted to 275,501 tons—a decrease of 22,564 tons upon the previous week, but an increase of 49,871 tons upon the same week of last year. For the year to date, the total shipments have been 10,386,004 tons—an increase of 1,034,321 tons upon the corresponding period of 1905.

Lighting the Kidderminster Market.

At a recent meeting of the Kidderminster Town Council, the General Purposes Committee presented a report on the subject of the lighting of the retail market. It set forth that the Council in July last referred back to the Committee a recommendation they had submitted. They had further considered the matter, and now recommend that the offer of the Kidderminster Gas Company to light the market for five years on Thursdays from dusk till 6 p.m., and on Saturdays from dusk till 11.15 p.m., from October to March (the pipes and fittings to remain the property of the Company) for the sum of £42 per annum, be accepted. Mr. P. Adam, in moving the adoption of the report, said the Gas Company and the Electric Lighting Company were approached again, and were asked to tender for lighting of 18,000-candle power. The Gas Company put in a tender for £42, which the Committee adopted subject to the approval of the Council; the Electric Company's tender being £68. Both Companies were put on the same basis with regard to fittings. He thought they might congratulate themselves upon the great effect of the change, which meant that they would save a good deal of money, and probably get a much better light. The report was adopted.

New Joint-Stock Companies.—The Whitland and District Water and Gas Company, Limited, has been registered with a capital of £25,000, in £5 shares (2500 being 7 per cent. preference), for the purpose indicated by the title. Cloke's Breeze, Limited, is the title of a Company registered with a capital of £6060, in £10 shares, to deal in breeze, clinker, and ashes.

Sale of Shares.—At Coatham, a few days ago, Mr. Newton Walker sold by auction 71 £10 fully-paid ordinary shares and 11 £10 fully-paid "A" shares in the Redcar, Coatham, Marske, and Saltburn Gas Company; the prices realized being £17 7s. 6d. and £17 10s. per share respectively. Nine £10 fully-paid "B" shares in the same Company sold for £13 each; and 50 new £5 (£4 paid) shares in the South Bank and Normanby Gaslight and Coke Company, Limited, were sold at £6 10s. each.



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An Experiment in Automatic Gas Lighting.

The Lighting Committee of the Lambeth Borough Council, in a report issued last Tuesday, stated that they had had under consideration an application from the Gaslight and Coke Company for permission to make experiments with an apparatus for automatically lighting and extinguishing street-lamps, on from 100 to 200 lamps in the portion of the borough covered by Lambeth Road, Westminster Bridge Road, Lambeth Palace Road, and part of Kennington Road. The Company undertook that no damage should be done to the lamps, that the lighting efficiency should be in no way effected, and that all the lamps in question should be in lighting at the proper schedule time. The experiments would be carried out at the Company's cost, and everything would be afterwards restored to the present conditions if the experiment did not prove a success. Having regard to all the circumstances, the Committee had decided that, subject to the right of the Council to order the removal of the apparatus at the end of the period, the Company should be allowed to experiment on the lamps in the manner desired for a period of three months.

Preservation of Welsh Water.

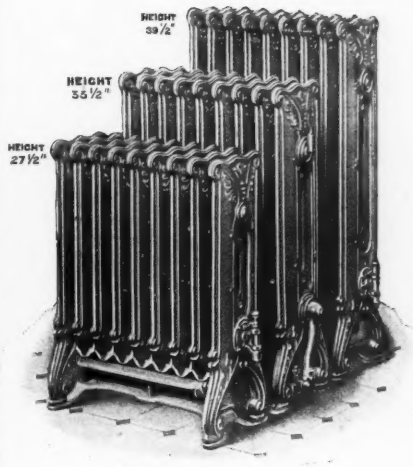
On Monday last week, a conference of the various governing bodies of Glamorganshire was held on the subject of the preservation of Welsh water for the people of Wales, and especially the water of South Wales for the people of that portion of the Principality. Mr. Blandy Jenkins, the Chairman of the Glamorgan County Council, who presided, said that since the last conference an Act had been obtained giving them power to inquire into the existing sources of supply. During the past ten years, the county population had increased by more than 133,000; and with the prospective establishment of new works, &c., there was every reason to believe that this rate of increase would go on for many years. All the District Councils had accepted the invitation to send delegates, and Cardiff and Swansea were also represented. In order to save expense, a combination of all districts would be the best course to pursue. The Local Government Board would no doubt refuse to permit this; but there were still powers of combination to a certain extent. Therefore they should form a Water Board, to accomplish which it would be necessary to obtain another Act of Parliament. They might feel that an offer should be made to Monmouthshire and Carmarthen to join them. After some discussion, it was resolved: "That this conference is of opinion that the Glamorgan County Council should engage an expert or experts to prepare a report as to the best method of dealing with the present and future water supplies of the Administrative County; and that when such report is prepared a further conference shall be called to consider it under the powers of the Glamorgan Water Act."

Public Lighting at Torquay.

A report on the lighting of the streets has just been presented to the Torquay Town Council by the Road Committee. It had been suggested that the lamps should be kept lighted to a later hour than at present; and on this subject the Borough Surveyor had been requested to prepare a statement of the cost of various alternative schemes. From this it appears that there are in use in the town 919 ordinary, 114 incandescent, and 5 special incandescent gas-lamps—a total of 1038; while of electric lights there are 52 arc and 151 incandescent, the latter being on 76 posts. The cost of the upkeep of the gas-lamps, both ordinary and incandescent, is £2 7s. 5d. each per annum; that of the incandescent electric lights, £2 10s., and of the electric arcs £20. The lamps are lighted for 639 hours 13 minutes in the summer months (April to September), and 1124 hours 14 minutes in winter (October to March); making a total of 1763 hours 27 minutes per annum. To convert the whole of the ordinary gas-lamps to incandescents at £1 16s. each would cost £1700; while to convert 64 of such lamps on the proposed tramway route would necessitate an expenditure of £126 15s. The expense of an extra hour's lighting each night would be for the gas-lamps (with gas at 3s. per 1000 cubic feet) 15s. per night, or £273 15s. per annum; for the incandescent electric lamps, 2s. 0·16d. per night, or £36 14s. 10d. per annum; and for the electric arc lamps, 15s. 3d. per night, or £278 6s. 3d. per annum. The total cost of one hour's additional lighting would thus be £588 16s. 3d. As this amount is nearly equal to the proceeds of a penny rate, the Committee were unable to advise the adoption of the suggestion that the hours of lighting should be extended. They, however, recommended the erection of certain new lamps, and the conversion of some of the ordinary gas-lamps to the incandescent system. The report was adopted.

Bradford Corporation and Afforestation.—The Water Committee's minutes submitted at last Tuesday's meeting of the Bradford City Council contained a reference to afforestation of lands belonging to the Water Department, and also a resolution stating that it was undesirable to appropriate any such lands for afforestation, in consequence of it being conclusively proved that there would be a financial loss. Alderman Holdsworth, the Chairman of the Water Committee, said he was of opinion that the reports and papers they had had on the subject proved there would be a huge loss if they carried out afforestation on these lands. Mr. A. C. Forbes, in making his report, had calculated afforestation on the basis of £6 or £7 per acre; but they found no case which justified such a basis. The Leeds Corporation planted 98 acres, and the cost was £13 per acre; while it took 10s. per acre for upkeep, without reckoning the cost of renewals—also a big item. They were informed, too, that during the first thirty years one man was required to look after every 20 acres; and were they going to take such a population on to the land? It was unfair to burden the present generation of ratepayers with such large sums, when they had a revenue of £3500 at present. After some discussion, an amendment was carried referring back the recommendation, with an instruction to the Water Committee to consider the best means of urging on the Government the desirability of a national afforestation scheme.

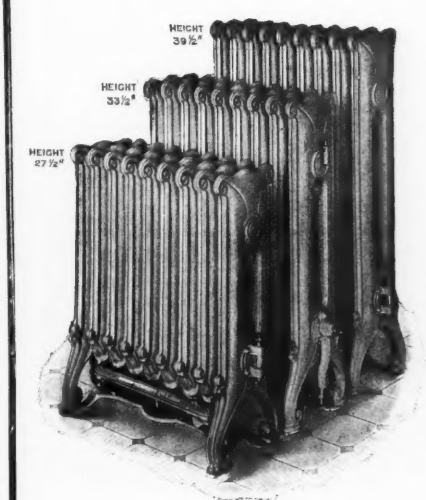
Richmond's



ORNAMENTAL.

Gasteam

RADIATORS



PLAIN.

Radiators.

Annual Report on the Leeds Water-Works.

The annual report of the Leeds Water Committee states that the amount expended on the works up to date is £2,932,266. The gross profits for the last financial year were £118,917; and after allowing £67,416 for interest, and £32,810 for repayment of debt, there was a surplus profit of £19,947—an increase of £7557 on the previous year. Reference is made to the work carried out in the Ure Valley in connection with the Colsterdale scheme, and the investigations which led to the decision to modify the original plans. It is remarked that from one of the trial holes, about 170 feet deep, 800,000 gallons of water per day were pumped; this quantity being sufficient to supply 30,000 people. With regard to the Laver Valley works, the report says negotiations for the estate, belonging to the Marquis of Ripon, have been practically completed, and notices to treat for the other lands in the valley have been served. The area to be taken is 649 acres. About a mile of the Kettlesing tunnel is lined and completed. In places the ground was found to be very bad, necessitating four rings of brickwork, and a heavy concrete base. Two air-compression plants are being used for driving the air-drills at the working faces, and at the same time ventilate the tunnel. There has been an increase in the net average daily consumption of water for domestic purposes from 9,597,629 gallons in 1897 to 10,134,633 gallons in 1906; but whereas in the former year the consumption worked out at 23·8 gallons per head, this year it has been reduced to 21·8 gallons. This saving has been brought about chiefly by a strict investigation of leakages, and the employment of special meters to locate them. The trade consumption shows an increase from 4,369,742 to 5,614,019 gallons in the same period. As to the afforestation work, last winter 98 acres were planted; the species of trees being Corsican pine, Douglas fir, Scotch pine, spruce, beech, birch, larch, alder, and mountain ash.

Reduction in Price for Power at Devonport.—It has been decided by the Devonport Gas Committee that gas for motive power shall be supplied at 3d. per 1000 feet less than that for lighting purposes.

Lamplighters' Wages in Newcastle.—The Watch Committee of the Newcastle-upon-Tyne Corporation and the Improvement Committee of the Gateshead Corporation have received an application from the lamplighters' requesting that they be granted one day's holiday per month, and an advance of 1s. per week in wages.

Public Lighting in Finsbury.—According to the annual report on the work of the Finsbury Borough Council during the year ending March 31 last, it appears that the total number of public lamps in the borough at the date mentioned was 1806. Of these, 672 had 3·25-feet incandescent burners; 568 had 4·25-feet incandescent burners and pilots, and 451 had 6·5-feet incandescent burners. The net cost of lighting, including all new work and additions for the twelve months, was £6641. The principal items were: Gas, £3974; lamplighters' wages, £1305; materials, mantles, tools, uniforms, &c., £830; gasfitters' wages, £411. The instalments connected with incandescent lighting only came to £69.

Interference with Gas and Water Pipes in Tramway Construction.—At the meeting of the London County Council last Tuesday, Mr. Penn Gaskell adversely criticized the accounts relating to the Council's tramways, and said he believed that it had lately been found that the cost of taking up gas and water pipes for the purpose of the construction of the tramways had been very great indeed. This cost would be enhanced when they got to the North, because the northern portion of London was much older than the southern, and therefore in all probability the number of gas and water pipes which would have to be dealt with would be greater, and they would be nearer the surface. He thought it was a most serious matter.

New Water Scheme for Penrith.—It is stated that there is a proposal afoot to acquire Hayeswater Tarn, a sheet of water lying in a cup-like hollow formed by High Street and Grey Cragg, on the northern border of the Westmoreland hills, as a water supply for Penrith. The Local Authorities have been in search of a new supply by gravitation for a good many years; but engineering or other difficulties have always made the task impossible. The lake is nearly 40 acres in extent, and stands at an elevation of 1383 feet above sea level. The water is of splendid quality. The line of pipes would be about 20 miles. The Earl of Lonsdale is the owner of the lake and also the surrounding hills. Mr. Baldwin Latham has reported to the Urban District Council on the matter.

Advertising on Electric Light Standards.—Referring to this subject, a correspondent writes to the Editor of the "Standard": "I notice in Fulham large enamel tablets fixed to the electric light standards with the following advertisement: 'Borough of Fulham: Electric light, 3½d. unit.' It would be interesting to know if the value of these advertisements is debited to the Electric Lighting Department. I also notice other channels being used for advertising in the same way by the councils. If the councils can make use of these positions for advertising, why not let them to other advertisers and benefit the rates? It is certainly a gross injustice if a council are allowed to advertise their business free of cost in competition with other concerns which are heavily rated and assessed; and the local gas companies, who are big ratepayers, do not get their advertisements for nothing."

A New Gasholder at Carrick-on-Suir.—To such an extent has the gas consumption at Carrick-on-Suir increased, that the Gas Company have been compelled to provide themselves with a second holder; and it was put to work a week or two ago in the presence of a large assemblage of townspeople. The ceremony of unlocking the valve was performed by Mrs. Apted, wife of Mr. W. A. Apted, the Gas Manager. The new holder was built by Messrs. Newton, Chambers, and Co., of Sheffield; but the greater part of the local labour was carried out under Mr. Apted's supervision. In the evening, the gas employees and a number of the townspeople were entertained at dinner by Mr. Apted, who, in a brief speech, welcomed the visitors. Mr. M. O'Brien, a member of the Urban District Council, in a few well-chosen words, paid a high compliment to Mr. Apted's courtesy and business capacity; and said that whatever differences the public might have with the Gas Company, they would always hold the Manager in the esteem he deserved.

The "MAIN"

SLOT FIRES.

ELEGANT DESIGNS.

The "Netley."

PRICE 24s. 6d.

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No. 1045.

10 in. fire, 26 in. high.

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10 in. fire, 26 in. high.

R. & A. MAIN, LTD.,

LONDON, GLASGOW, FALKIRK, &c.

Gas Explosion at Brentwood.—An escape of gas in a house at Brentwood, last week, led to an explosion, by which a good deal of damage was done. The maidservant, on going downstairs in the morning, struck a match, and this ignited the gas present. She, and a neighbour who came on to the scene, sustained some burns; and the contents of the drawing-room were set on fire.

Dartmouth Water Supply.—A conference took place on Thursday last between representatives of the Admiralty and the Dartmouth Corporation, relative to the water supply of the town and the provision of a supply to the Royal Naval College. It was afterwards announced that the Council had come to very favourable terms with the Admiralty, who were going to help them with regard to the water supply.

Illuminating Power at Falmouth.—The General Purposes Committee reported to the Falmouth Town Council the receipt of a letter from the Gas Company, stating their intention to apply for an increase of capital, and asking whether the Corporation approved of an application being made at the same time for a reduction of the candle power. The Committee came to the conclusion that, owing to the lack of information, the Corporation were not in a position to offer any opinion at the present time. It was thought premature to discuss details in the absence of full particulars; and the Corporation approved of the Committee's minute.

Opening of New Water-Works at Colwyn Bay.—Last Tuesday the new water-works which have been constructed at a cost of £4500 for the supply of the high-level portion of Colwyn Bay were formally opened by Miss Roberts, the sister of Mr. J. H. Roberts, M.P., Chairman of the Urban District Council. The works comprise a pumping-station and a well; while the pumps have a lift of 350 feet, and are capable of raising to the reservoir (650 feet above sea level) about 5000 gallons per hour. Over 3 miles of mains have been laid in carrying out the scheme, which was designed by Mr. William Jones, the Council's Engineer. Mr. G. Law, of Kidderminster, was the Contractor.

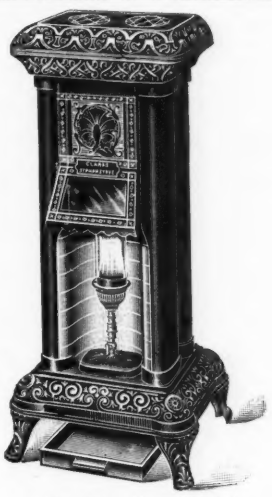
Incandescent Gas Lighting for Churches.—The famous old church at Ross, Herefordshire, has lately been fitted with 55 Bland inverted burners, in place of the 225 ordinary gas-jets previously in use. In a letter to Messrs. Bland and Co. on the subject, the Churchwarden (Mr. Watson) says: "Formerly the church was in semi-darkness; it is now brilliantly lighted. The saving of gas will be very great. Previous to fixing these burners, the gas was supplied from two meters, one supply-pipe each, 1¼ inch and 1 inch; and, incredible as this may seem, the whole of the 55 Bland burners are fully lighted from a ⅝-inch pipe only. The old meters and pipes have not been taken out, and are still there to be seen. The ⅝-inch pipe is fixed as a bye-pass would be."

The Gas Suffocation Case at Liverpool.—On Monday of last week, the Liverpool City Coroner (Mr. T. E. Sampson) opened the inquest on William P. Barton (aged 38) and Arthur Tollet (aged 8), whose deaths were—as recorded in last week's "JOURNAL," p. 116—supposed to have been caused by an escape of gas in a bedroom. The Coroner said that there was another little boy who was very ill in the hospital; and he hoped he would recover, because they might be able to get some information from him as to how the affair arose. He was told it would be necessary for him to remain in hospital for another fourteen days; and he suggested that after evidence of identification had been taken, the inquest should stand over. Formal evidence was then tendered; and the inquiry was adjourned until the 25th inst.

A Public Lighting Dispute at Holywood.—At the monthly meeting of the Holywood Urban District Council, the Town Clerk (Mr. D. Bell) read a letter from the Gas Company complaining of interference by the Council with the meters attached to the public lamps. The Directors say they have no objection to the Council reducing the size of the burners; but they will naturally not permit the metered lamps to be reduced to a minimum while twelve times their number of other lamps are allowed to consume freely without check or hindrance. They also urge that many of the bye-pass lights in the meter-lamps are much smaller than those in lamps which have no meter, and that this is most unfair to the Company, who supply gas on the average-meter system. The Clerk was requested to write to the Company asking for full particulars as to the allegations they had made.

Price of Gas at Westhoughton.—A deputation of the Westhoughton Urban District Council lately interviewed the Gas Company, and stated that if a reduction in the price of gas was granted, the amount saved would no doubt be applied in increasing the number of lamps or improving the quality of the lighting of the town. The Directors promised to give the matter their early consideration; and they have since written to the Council saying that although they were at the present time unable to accede to the request of the deputation, they fully appreciated the desire of the Council for the better lighting of the district. This point had been carefully gone into; and the Company assured the Council that assistance would be given in the direction at as early a date as possible. It was, however, they added, only right to remind the Council that the present price was fixed twenty years ago. At that time the charge in neighbouring townships was higher; and they had only lately come into line.

A Question of Local Contracts at Bradford.—On the minutes of the Gas Committee coming up for approval at last week's meeting of the Bradford City Council, Mr. Haley protested against a contract for pipes being allowed to go to an outside firm. The contract, he said, was a large one, and would amount to about £30,000 a year. It was a question of price; and it meant that next year the Bradford firm which had previously done the work would try to screw down the men's wages. At public dinners he had often heard it deplored that there was only one trade in Bradford; but no encouragement was given to anyone to start others. Mr. Stringer, the Deputy-Chairman of the Committee, said the matter was a trifling one. The Bradford firm to whom Mr. Haley referred had been given a fair proportion of the orders for pipes; and the contract which had gone outside was only for £100 or £200. To the best of his knowledge, the contract had been approved at the last meeting of the Council; but if not, it would be included in a minute referring to miscellaneous stores, which he was quite willing to take back. The minutes, with this exception, were approved.



No. 25. New Model.

THE STOVES FOR HIRE.

CLARK'S PATENT HYGIENIC

"SYPHON" RADIATORS FOR GAS.

SAFE, RELIABLE, AND POWERFUL HEATERS.

WRITE FOR FULL PARTICULARS.

S. CLARK & Co.,
Compton Works,
Canonbury Road,
HIGHBURY, LONDON, N.
Showrooms: 58, *Holborn Viaduct, E.C.*

No. 26. New Model.

A Natural Hot-Water Supply.—The town of Mutteburra, in Queensland, has a natural hot-water supply, says the "Builder." The water is drawn from an artesian well, and is piped to the houses of the consumers, where it arrives at a temperature of 138° Fahr.

Heywood Water Supply.—Last Friday, the Heywood Town Council passed a resolution favouring the promotion of a Bill to obtain borrowing powers for £150,000 for the completion of the Ashworth Moor new reservoir, on lines recommended by Mr. J. Diggle, their Engineer.

Gas Poisoning Case at Bolton.—A woman and her grandson, who live in a cellar at Bolton, had a near escape from death a few days ago, owing to a leakage in a main allowing gas to enter the cellar by a hole near the door. When found, the woman was in a dazed condition; while her grandson was on the floor unconscious.

Fire at the Cardiff Gas-Works.—On Sunday night, a fire broke out in the meter-stores at the works of the Cardiff Gas Company in Bute Terrace; but though a large number of meters were destroyed, the outbreak was soon extinguished. The damage is estimated at about £200. The fire is believed to have been caused by spontaneous combustion from waste.

The Nottingham Gas Question.—Naturally, the gas question is in evidence in the municipal election speeches at Nottingham. Referring to the matter a few days ago, Mr. C. H. Wade said he could not regard the Special Committee's report as quite satisfactory. The ratepayers might have been given more details in regard to what was investigated and what was discovered, without infringing upon evidence which was understood to have been given confidentially. It must not be forgotten that a good profit was made on the gas undertaking, which he would not criticize further than to say it was perfectly true the luminant had not been satisfactory. At another meeting, Councillor Elborne said the ratepayers had a full right to every information in regard to the gas question. There was, he thought, something serious in the matter, and something detrimental to the majority on the Council, or the affair would not be hushed up as it had been. Serious allegations had been made against the Gas Engineer; and he had even been asked to resign his position. This the Gas Engineer had refused to do; and an inquiry was made into the matter, with the result that the allegations made against him were found to be false.

The Directors of the Bristol Gas Company have ordered a second simultaneous discharging-charging machine from Messrs. Aldridge and Ranken, to complete the equipment of their retort-house. It is to be delivered by the 1st of December next.

In another part of the "JOURNAL" will be found the announcement which appeared on the 2nd inst. of the intention of the Directors of the Croydon Gas Company to issue by tender £20,000 of "D" stock (5 per cent.); and it may be pointed out that the tenders must be received at the Company's offices not later than 9 a.m. to-morrow.

Owing to a failure of the electricity supply, Brighton suffered a short spell of semi-darkness last Wednesday night. The lights did not actually go out; but the illumination from them was reduced almost to vanishing-point. The occurrence is reported to have been due to some hitch in the switch gear at Southwick. Heavy rain was stated to be the cause of an electric lighting failure at Dublin on Thursday. During the whole of the night a large number of the leading thoroughfares were in all but complete darkness.

By an announcement which appears elsewhere, our readers will see that the Bournemouth Gas and Water Company are inviting tenders for an issue of 2180 six per cent. £10 preference shares, at a minimum price of £14 each. The money is required for the new works now being erected at Poole, and for the extension of the existing works and plant to meet the increased demands resulting from the development of the Company's district. The total preference capital, including the present issue, will amount to £75,000. Tenders must be in the hands of the Secretary on the morning of the 1st prox.

Many of our readers, especially those in the London district, have at times had business relations with Mr. J. E. Bartle, the Works Manager and a partner in the firm of Messrs. James Bartle and Co., of the Western Iron-Works, Notting Hill, which were established about forty years ago by his uncle, the late Mr. James Bartle. After many years' devotion to the business, in which his skill in the production of connections which others regarded as difficult was conspicuously displayed, he has retired, and the works will now be carried on by Mr. George Bird, who for about twenty years has been associated with the firm as a partner.

Although we have not yet experienced any of the chilliness which gives us a foretaste of winter, the present is the season for making provision for obtaining warmth when the time comes to need it. The attention of gas managers and others may therefore be directed to a booklet which has just been issued by John Wright and Eagle Range, Limited, of Birmingham, furnishing particulars of their various gas-heated steam-radiators. The firm are pioneers in the gas-radiator business, and have made it their peculiar province. This season they have brought out two important novelties—an entirely new range of "St. Andrew" radiators in single column, and an additional size (a five-loop) to their "St. Denis" condensing radiator. Prices, dimensions, and full particulars are given of the radiators shown.

The second annual general meeting of the Birmingham and District Master Gas-Fitters' Association was held recently, when the statement of accounts presented showed an income of £32, and a slight balance in hand. The President (Mr. Charles Breeden) said they all knew what it was to work against a rate-aided body like the Gas Department; and it was almost too much to expect that at the time of the interview the Committee would grant all their requests. But they might now see their way clear to give the gas-fitters some further concessions. The Association had not fired its last shot, and there was much work to be done. He suggested that they should test the feelings of the candidates for the City Council upon the points which were of so much importance to them as traders. It was unanimously resolved that the report be approved, and that the officers and Committee be thanked for their services in the past year.

PARKINSON'S NEW RADIATOR.

The "WESTMINSTER."

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COTTAGE LANE, CITY ROAD, LONDON. | BELL BARN ROAD, BIRMINGHAM.